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POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REG U.S PAT OFF REGD TRADE MARK GREAT BRITAIN No. 426815

LIFE RAFT for AIRPLANES

See Page 687

MONEY~MONEY more MONEY

CHICAGO, ILL.
Ontario & Michigan Blvd.

KANSAS CITY, MO.
22nd & Oak Sts.

CINCINNATI, O.
9th & Walnut Sts.

I MAKE a business of helping young men succeed. Every year thousands come or write to me—

"How can I make more money? I want a better job—more pay—a bigger future."

Money! Money! More MONEY! Ambitious men want to advance. Young men want to get started in trades and businesses which pay well. All want to live well—to be happy, prosperous, SUCCESSFUL.

"Know how to do some one thing well," I tell them. "Be a trained man. Learn by actually doing, under competent instructors, the work you would like most to do. Become an expert. Then dig in and work hard, save, and be independent, SUCCESSFUL."

Now Three Big RAHE Schools.

Fourteen years ago I began helping young men make more money. At Kansas City, Mo., I opened the RAHE Auto and Tractor School. The school grew. Last year I decided I must further enlarge. Either more floor space at Kansas City, or establish new schools. I opened the Cincinnati school—not a branch, but an independent, full-fledged Auto and Tractor School, teaching the RAHE-Way. From the day it opened its doors it has been a success. The new Chicago School has just opened—it is ready now to teach the RAHE-Way to the thousands of young men in Chicago's big territory who have wanted for years to equip themselves with this practical training for life.

Big Money For Ambitious Men.

Three Billion Dollars, it is estimated, will be spent this year on motor upkeep. This is my advice to ambitious young men, the fellows who want to get ahead, to be independent. Equip yourself the RAHE-Way. Learn Auto and Tractor mechanics **thoroughly.** Be an expert. Then pick your job from the many openings available when you leave my school. Go to work, and work hard. You will make good money, mighty good money for a young man. SAVE a good part of these earnings, put them away in the bank. In a year or so you may be **independent**—in a position to start a garage of your own. Not a large one right away perhaps, but if you know how to give good service, your business will grow. In time you will be making—well, you will set your own income. Garage owners make as high as $50,000 a year, others plug along making $3,000 or $4,000. It is all up to the man—his training, how hard he will work, his ability to save, his ambition and his initiative.

But I want you to remember this. **Thorough training pays.** And the way to get this thorough training is to work under the Master Mechanics in a RAHE School. Here is what you get under a RAHE Life Scholarship—complete Automobile and Tractor Training, including Transmissions, Engine Assembly, Starting and Lighting Systems, Storage Batteries, Carburetion and "Trouble Shooting," Welding and Cutting, Forging and Soldering, Vulcanizing, Tire Repair, Rebuilding and Retreading, Complete Machine Shop Practice, Special Ford work, Truck and Tractor instruction.

Special Limited Time Tuition Rate $100

A complete Rahe Life Scholarship for $100. For a limited time only, I am offering the entire Rahe Course at this new rate—$50 saving over my regular rate of $150. The offer first was made to introduce the new Chicago School. But it wouldn't be fair, I decided, to make an offer for Chicago that I wouldn't duplicate at Kansas City and Cincinnati. So, for $100, you can receive the complete Rahe Life Scholarship—which entitles you to training as long as you want to attend, any time, at any of the Rahe Schools.

Decide to come now. Decide to give yourself the practical training for life which every young man should have. Fill out the Coupon below. I will send you my 68-page book. It tells how other men have trained for big pay positions, independence, prosperity, SUCCESS. Fill out the Coupon NOW.

HENRY J. RAHE, Dept. 2891

3 Big Auto and Tractor Schools

CHICAGO, ILLINOIS
Ontario and Michigan Blvd.

KANSAS CITY, MO.
22nd and Oak Streets

CINCINNATI, OHIO
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LEARN HERE in 6 to 8 WEEKS

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Send this coupon today for my 68-page Catalog showing graduates success and opportunities now open. (Address nearest School.) 2891.

Name .....

Address .....

Age..... *Occupation*.....

Popular Mechanics Magazine

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VOL. 36 NOVEMBER, 1921 No. 5

New Antarctic Expedition Now under Way

THE noted antarctic explorer of pre-war days, Sir Ernest Shackleton, has organized a new expedition which will explore land areas of the antarctic during the next two or three years, involving a voyage of about 30,000 miles. Besides the ordinary researches, such as geology, climatology, and hydrography, there will be added to the study of aerology in the abstract a number of airplane experiments which are expected to have an important bearing upon the future of aviation. For this purpose the expedition is equipped with a seaplane and a kite balloon. The ship carrying the expedition is a miniature craft of only 200 tons, appropriately called the "Quest," and will have on board, besides Sir Ernest and his scientific colleagues, a representative from each of the British dominions, Canada, Australia, and New Zealand, as well as two boys scouts, who were picked by Sir Robert Baden-Powell, the originator of the boy-scout idea, from a thousand applicants. These proud youngsters, both of whom are Scotch boys, know all about boats and the sea, and are to act as cabin boys during the voyage.

WIDE WORLD PHOTOS

Passage through Tower Bridge, in London, of the Miniature Sailing Ship "Quest," That will Carry the Shackleton Expedition to the Antarctic Regions on a Voyage of Exploration and Research: In Passing the Bridge, the "Quest" Is on Its Way to be Fitted Out for the Expedition. It Sailed in September

ADJUSTABLE BACKREST SIMPLE AND HANDY

A new adjustable backrest is adapted to many uses. It serves as a comfortable "lazy back" for a canoe, or on the porch

The Backrest in Use: Simplicity, Comfort, and Usefulness have All been Considered in Its Design. The Insert Shows the Back and Seat Pads

or lawn, and is particularly useful in the sick room. It can be placed in the bed to support a patient at any angle desired. The frame is of nickelplated steel. Latticelike strips, covered with a removable cushion, support the back and are hinged to a base. By means of a brace which fits into a series of notches in the base, the back is easily adjusted to any angle. A cushion, provided as a seat, prevents the rest from sliding away when the user leans against it. The whole outfit is light and can be folded into a small space for carrying.

FOREST-PRODUCTS LABORATORY ESTABLISHED IN AUSTRALIA

A forest-products laboratory is about to be established in West Australia which, it is hoped, will develop into an institution similar to those at Madison, Wis., and at the McGill University, Montreal, Can. Investigations have already shown that without doubt there exist forest growths in Australia from which a satisfactory paper pulp can be made. The supply of raw material is plentiful, and a pulping mill could work on some of the native woods without in any way reducing the supply of merchantable timber. At present the wastage of good timber is so extensive that it is estimated that about 60 per cent of the timber felled for milling purposes never reaches the form of salable lumber.

SIZE OF PORT OF MARSEILLES IN FRANCE TO BE DOUBLED

Constructional work is already under way in connection with a plan to double the maritime capacity of Marseilles, already the largest port in France, and the second largest city. Some idea of what this means may be gathered from a consideration of the present capacity of the port. With its 10 basins it covers an area of 780 acres, and has about 15 miles of wharf and 36 miles of railroad.

SIMPLIFIED STEREOPTICON IS EASILY PORTABLE

By developing a miniature lantern slide it has been possible to reduce the size of stereopticon lanterns, making them easily portable. The standard lantern slide is 3½ by 4 in. The new slide is less than half that size, and is mounted in an embossed press-board frame. The weight of 100 slides is only 40 oz., and the frame largely prevents breakage. The small size does not in any way affect the clearness of the picture thrown on the screen, but the reduced area of the slide makes it possible to simplify the optical system of the lantern and reduce its size and weight. The new lantern can be carried under the arm and requires only one adjustment, focusing. A nitrogen lamp is used which can be attached to an ordinary light socket.

This Miniature Stereopticon and Its Slides can be Carried Anywhere and Attached to a Light Socket. It Produces Perfect Pictures

OBSERVATORY IN GERMANY TO TEST EINSTEIN THEORY

AN observatory has recently been built near Potsdam, Prussia, for making astronomical observations to test Einstein's theory of relativity. The tower telescope is of the type of the American Hale telescope. The cœlostat rests on a wooden tower, incased in a stone one with an extensive base containing a fully equipped modern laboratory. The exterior of the building has a fortlike appearance.

FRENCH BICYCLE MOTOR SAID TO BE SMALLEST MADE

A motor, of French manufacture, to be attached to an ordinary bicycle, is said to be the smallest motor in practical use.

The Smallest Gasoline Motor: It Drives a Bicycle at 20 Miles an Hour and Runs 50 Miles on One-Third Gallon of Gasoline

The cylinder has a stroke of only 2.2 in. and a bore of 2 in. It develops 1¼ hp. at 2,500 r.p.m. and has attained as high as 3,600 r.p.m. during tests. The oil supply is entirely automatic, and ignition is by means of a high-tension magneto with fixed control. An automatic carburetor is used, and the speed is regulated between 5 and 20 miles an hour by means of a throttle lever. A tank on the handlebars holds ⅓ gal. of gasoline, sufficient fuel for 50 miles. The motor can be disengaged with a hand lever so that the machine can be pedaled. An amateur mechanic can fit this motor to a bicycle in a few minutes.

BELGIUM SEEKS INFORMATION ON INDUSTRIAL EFFICIENCY

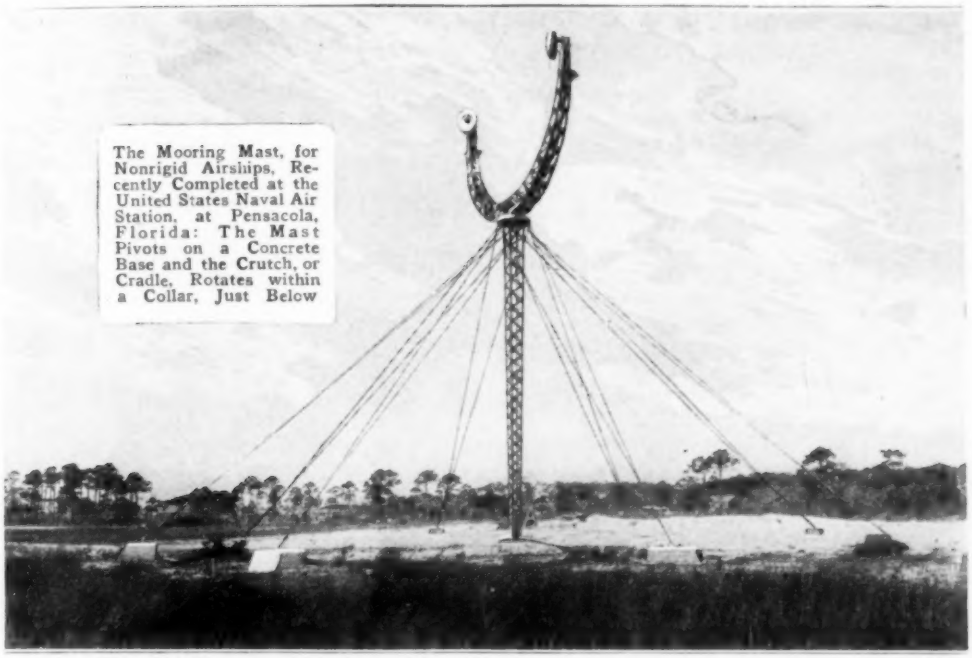
An example of the spirit responsible for the marvelous industrial rejuvenation taking place in Belgium, was displayed in Antwerp when a large American concern showed moving pictures of its manufacturing processes, for the benefit of local employes. Though the pictures were intended for employes only, the company was flooded with requests for tickets from outsiders. It staged an extra show and again had a full house. One of the largest motion-picture houses in Brussels, with branches throughout Belgium, then bid for the films and is now showing them. The Belgians are displaying an intense interest in American methods of industrial efficiency.

SIMPLE OIL-BURNING DEVICE REPLACES GAS BURNERS

With the object of conserving the natural-gas supply in a district of Pennsylvania, an oil burner of exceptional simplicity and efficiency has been developed. In operation it is as simple as a common gas burner, its valves working automatically. It requires no preheating of the oil, and dispenses with all auxiliaries, such as pumps, motors, and steam or compressed-air devices. In this burner, the oil is first vaporized, and then burnt like any other gas, the whole operation taking place in one compact unit. The burner was designed primarily for use in dwelling-house furnaces, but it has been found to be equally applicable to the furnaces of large industrial plants. In this connection it has carried out the purpose for which it was first designed, for it has been found to be even more economical than the natural gas it displaces.

Oil Burner of Exceptional Simplicity That First Vaporizes the Oil, and Then Burns It like Any Other Gas: It Operates Automatically in Dwelling-House Furnaces

¶ Fuel-oil tanks with a capacity of 20,000 bbl. have been installed at Unalaska in the Aleutian Islands, for the convenience of transpacific and coastwise shipping.



The Mooring Mast, for Nonrigid Airships, Recently Completed at the United States Naval Air Station, at Pensacola, Florida: The Mast Pivots on a Concrete Base and the Crutch, or Cradle, Rotates within a Collar, Just Below

U. S. NAVY BUILDS NEW TYPE OF DIRIGIBLE MOORING

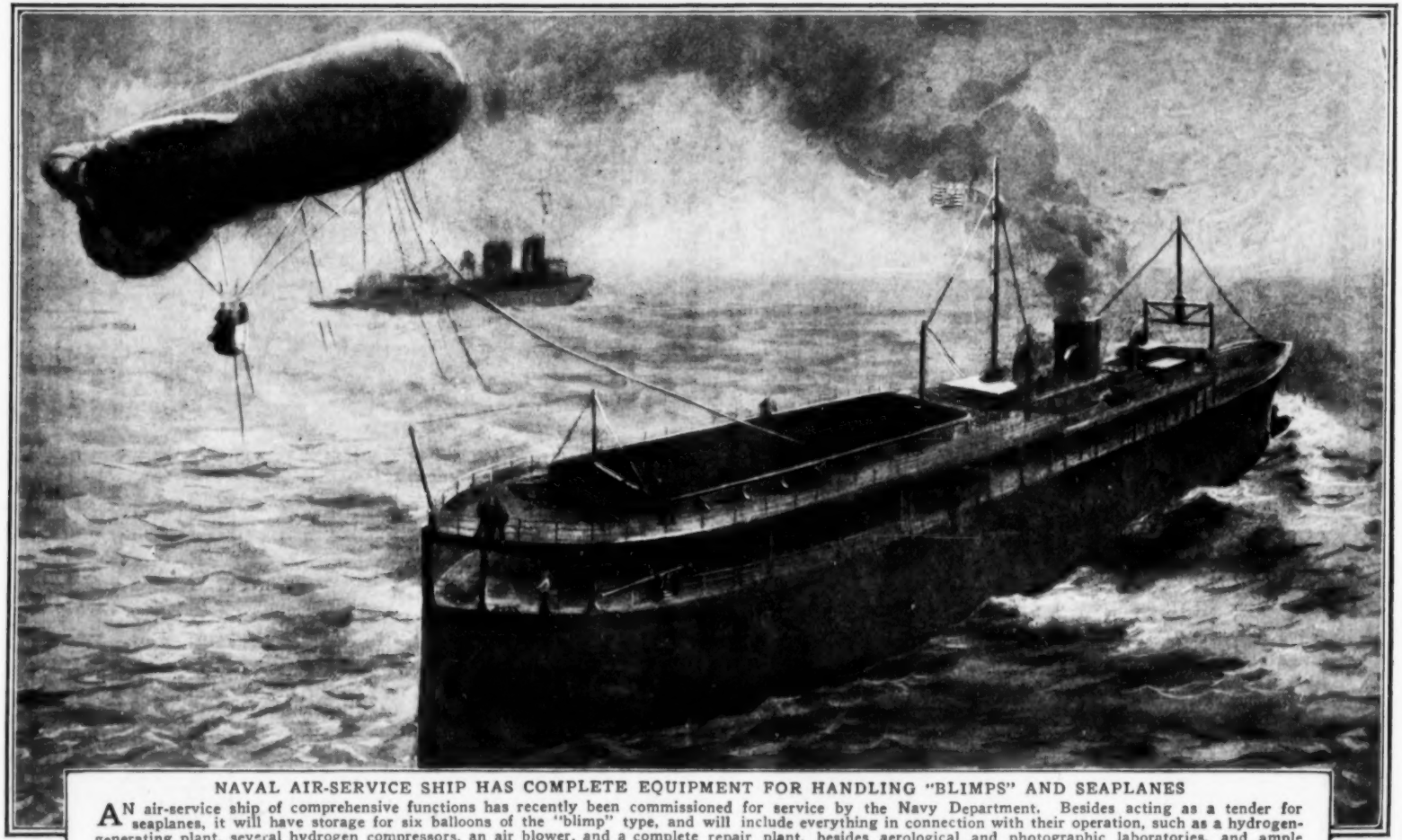
A mooring mast for nonrigid dirigibles, constructed at the United States Naval Air Station at Pensacola, Fla., consists of a lattice-steel mast on a concrete base, supporting a semicircular inverted arch, or crutch, of trussed-steel construction. The mast rotates within a collar guyed to concrete footings. A wire rope extends from a winch at the base of the mast to a pulley in the crutch and then to the ground. The dirigible picks up the free end of this rope by means of a line dropped to the ground, and it is made fast to the ship. The ship is brought down to the crutch by means of the winch. Two lines, from small winches at the top of each crutch arm, are snapped to eyes on the envelope of the ship and it is pulled firmly against bearing pads by the winches.

NEW AUTO SIGNAL USES INCANDESCENT NEON GAS

Neon, a rare gas existing in the air with other elements, is used in combination with electricity, to illuminate an attractive new auto signal. The signal consists of a neon-filled glass tube, outlining a human hand on the background of a dull, black metal disk. At each end of the tube is a terminal to which the wires from an induction coil in circuit with the auto battery, are connected. By depressing a push button located on the steering post or wheel, the circuit is closed. The contact

Auto Signal, Attached to Rear of Car, Made of Glass Tubing Filled with a Gas That Becomes Incandescent When an Electric Current is Sent through It, and Shines with a Red Glow

immediately brings the neon to incandescence. The signal hand assumes a bright-red fog-piercing color, and is a startling warning to the car behind. It can be attached to any part of the car. On closed cars, the rear fender is best.



NAVAL AIR-SERVICE SHIP HAS COMPLETE EQUIPMENT FOR HANDLING "BLIMPS" AND SEAPLANES

AN air-service ship of comprehensive functions has recently been commissioned for service by the Navy Department. Besides acting as a tender for seaplanes, it will have storage for six balloons of the "blimp" type, and will include everything in connection with their operation, such as a hydrogen-generating plant, several hydrogen compressors, an air blower, and a complete repair plant, besides aerological and photographic laboratories, and ample crew accommodations. It is appropriately named U. S. S. "Wright," in honor of the originator of modern air craft.

NEW ELECTRIC SILVERPLATING METHOD SAVES HALF TIME

A process of silverplating, which requires only half the usual time, was discovered not long ago by Frank Mason, a lecturer at Sheffield University, England. During some experiments he noted that very fine deposits were obtained at an extraordinarily rapid rate when silver-depositing baths contained a high percentage of potassium carbonate. These deposits were exceptionally smooth and very readily finished. They were obtained with a current density of eight amperes per square foot of electrode surface. This figure is an increase of 100 per cent in the maximum density permissible in the ordinary double cyanide-of-silver and potassium bath. It is obvious that with the doubling of current per unit of electrode area, an equal weight of deposit should be obtained in half the time otherwise required. The process has been adopted successfully on a commercial basis in an English establishment. It has been used over a long enough period to test its practicability thoroughly and has deposited many thousand ounces of silver of the finest texture at twice the normal rate. In large plating establishments the saving of time effected is very important, and the reduction of capital outlay is no small item when the cost of installing even one extra plating vat is considered.

MOLDS FOR CONCRETE MADE FROM COMMON MUD

Ordinary sticky mud is employed by a cement worker near Cincinnati, Ohio, in forming molds for concrete garden benches and lamps. His method is to build up a mud mold held together with

Oddly Shaped Lamp-Posts are Also Cast by Using the Mud Molds. When the Concrete has Thoroughly Set the Mud is Dug and Washed Away

stones and pieces of wood. Into this he pours the concrete. When this has set, the mud is dug and washed away, leaving the concrete form. Lamps are molded in three pieces—base, stem, and top—and benches in two pieces, for convenience in handling. The divisions are made by means of sheets of paper. In the molding of the lamps, a piece of gas pipe is placed in the center of the form as a lead for the electric wires and to strengthen the lamp. A thin coat of colored cement is sprayed or splattered over the finished object in much the same way that stucco is applied. On account of the nature of the material used for the molds and the method of forming them, the chance that two benches or lamps would become exactly alike is scarcely to be reckoned with.

Artistic Garden Benches are Made of Concrete Cast in Molds of Common Mud. No Two of These Benches Are Ever Exactly Alike

¶ The white clay and bauxites of central Georgia are being investigated coöperatively by the Bureau of Mines and the Central of Georgia Railway. Preliminary tests showed that by roasting the clays at 500 to 600° C., they became very like English china clay, while remaining practically as plastic.

NEW SPECTROSCOPIC TEST FOR PURITY OF GOLD

A new method of determining the purity of gold has been developed by the United States Bureau of Standards. An instrument is used which passes small electric sparks between two pieces of the gold. These sparks are photographed through a diffraction grating, and the spectroscopic lines, appearing on the negative, show impurities as small as one part in 1,000,000 parts. This method is faster, less expensive, and more accurate than the assay method of testing. It has proved that the 1,000-fine grade of gold, which is the highest grade, is only 99.97-per-cent pure.

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The Instrument Used in Applying the Spectroscopic Test to Gold: This Method, Developed by the United States Bureau of Standards, Gives the Most Accurate Results of Any Test Known

INGENIOUS FLYTRAP BUILT BY 15-YEAR-OLD BOY

A novel flytrap, contrived by a 15-year-old cabin boy, is used in the captain's cabin of the Japanese steamer "Tenpaisan Maru," sailing between Columbia River ports and Europe. A series of slats on an endless belt are smeared with honey or sirup, to attract the flies. The belt is slowly revolved by clockwork and disappears into a box, containing the clockwork and a screen cage. As the slats pass, the flies are automatically scraped off into the cage.

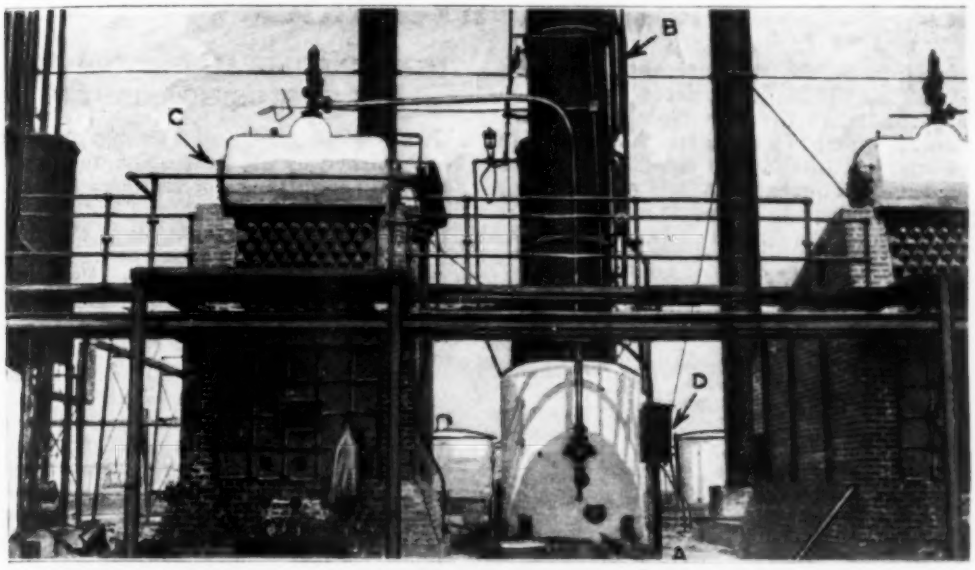
RIGHT AND WRONG WAY OF LOADING A WAGON

There is a right and wrong way of handling a partial load in a wagon from the viewpoint of economy of pulling power. Heretofore, the coal man and teamster have invariably piled the heavier part of a load under the front seat and over the front wheels, figuring that pulling was made easier thereby. Such is not the case, however, for facts disclosed during a test made by the Iowa Experiment Station, clearly show that 28 per cent more pull is necessary when the material is so loaded. During the test, a load that required 460 lb. of pull to move it at the rate of 1.75 miles per hour when the load was over the rear wheels, required 590 lb. of pull when the load was over the front axle. Readings for the test were taken from a tractor dynamometer and the test wagon was hauled over different ground each time. The extra power required depends on the standard practice of having the front wheels smaller than the rear wheels. This was verified by changing the wheels around in some of the tests, showing that the front wheels, when larger, required less draft.

WORLD'S HUGEST TANK STEAMER TO AID U. S. OIL INDUSTRY

With a capacity of 130,000 bbl. of crude oil, the world's largest tank steamer is now being outfitted for service in the oil industry of the United States. This huge tanker has a length of 555 ft., a beam of 75 ft., and a draft, when fully loaded, of 30 ft. Its dead-weight tonnage is 20,300. It is expected that with all tanks full, it will have a speed of 12⅓ miles. Its power equipment is three Scotch boilers, and triple-expansion engines. It is not surprising therefore, that the vessel represents an investment of nearly $4,000,000. There is a sister ship being built, and together with another ship in the service that is of only 300 less tonnage, the three vessels will form part of the greatest fleet of oil tankers anywhere in the world.

¶A twin double-leaf trunnion-bascule bridge is to be built over the south channel of the Mystic River, Boston, Mass. Each span will be 118 ft. between trunnions, and will carry an electric railway, a 25-ft. roadway, and a 5½-ft. sidewalk.

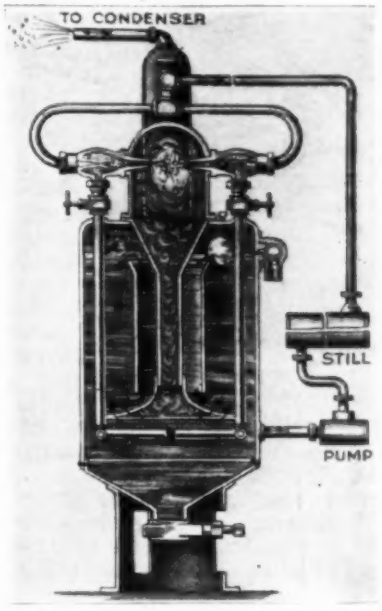


Installation of Apparatus in Connection with New Method of Obtaining Gasoline from Fuel Oil by an Impact Process: Indicated by Letters, C Is the Still Where the Process Begins, Passing to A, Which Is the Converter, the Point Where the Impact Takes Place Being at D. At B is the Rectifier

GASOLINE PRODUCED FROM FUEL OILS BY NEW IMPACT PROCESS

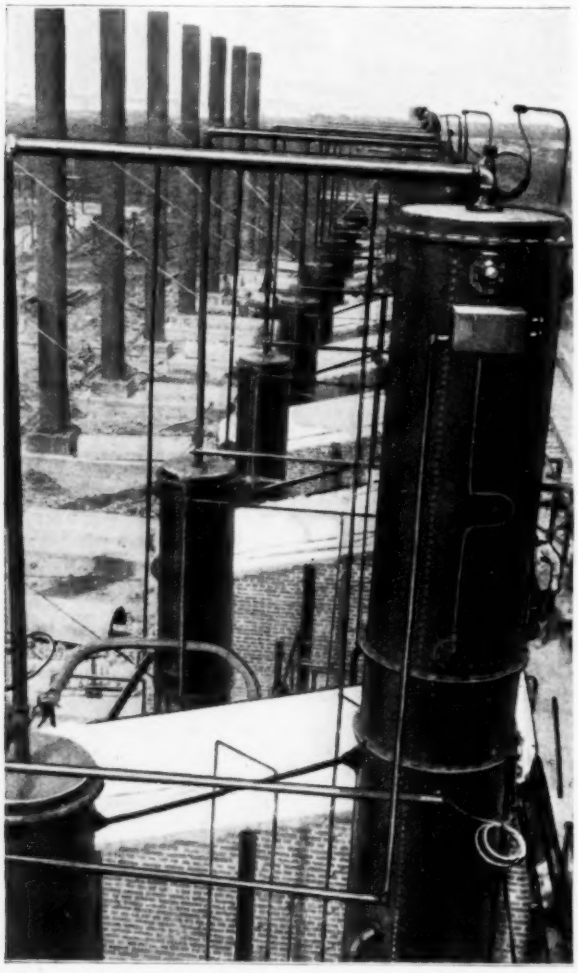
ANY new means of increasing the production of gasoline would certainly be of enormous value in these days of the gradual depletion of the present source of supply, while at the same time its industrial applications are steadily on the increase. The present source of supply is confined to the distillation of petroleum, and that involves a residuum of other distillates that are of comparatively little value, particularly of the final product now known as fuel oil, which until recent years was almost valueless.

There is now being developed a means of increasing the supply of gasoline, by adding to what is now produced by distillation alone, a further supply obtained by a recently patented method of treating fuel oil. The principle of this method is based upon the results of the action of impact. The process is carried out by subjecting a mass of fuel oil to concussive impact, which imparts to it sufficient kinetic energy to cause dissociation of the constituent elements of the fuel oil, and their subsequent reforming into new products, one of which is gasoline. This is done by first placing the oil in an ordinary still, where it is subjected to heat in the usual way. Connected to this still is a force pump, which by means of high pressure drives the gaseous products out of the still, and through piping from above it to the center of a C-shaped pipe to the two ends of which are fitted spraying nozzles with minute orifices. These nozzles are pointed at each other and are a very short distance apart, so that when the gaseous vapor issues from them at extremely high speed, the two streams come together with such force of impact that it causes dissociation of the



Sectional View of Converter: Gaseous Products from Still, Shown Much Reduced in Size, are Forced by Pump beneath, through Pipes above It, to the Two Nozzles Where the Impact Takes Place

elements of the vapor, one of which is gasoline. These dissociated gases then are conducted through piping to a condenser which is similar to those used in ordinary distillation processes. All of the gaseous products from the still are not broken up at the first impact, and these



A Number of Units, Installed in a Large Oil Plant, for Carrying Out the New Method of Extracting Gasoline from Fuel Oil

drop into a tank below the nozzles, and are returned by the pump to the still, where they are again put through the process, and this continues until the whole of the oil has been broken up.

There are plants now in operation carrying out this process, and it is said that they obtain from 60 to 75 gal. of high-grade gasoline from 100 gal. of fuel oil. If such a result is possible, the output of gasoline should soon be doubled, with an equivalent reduction in price.

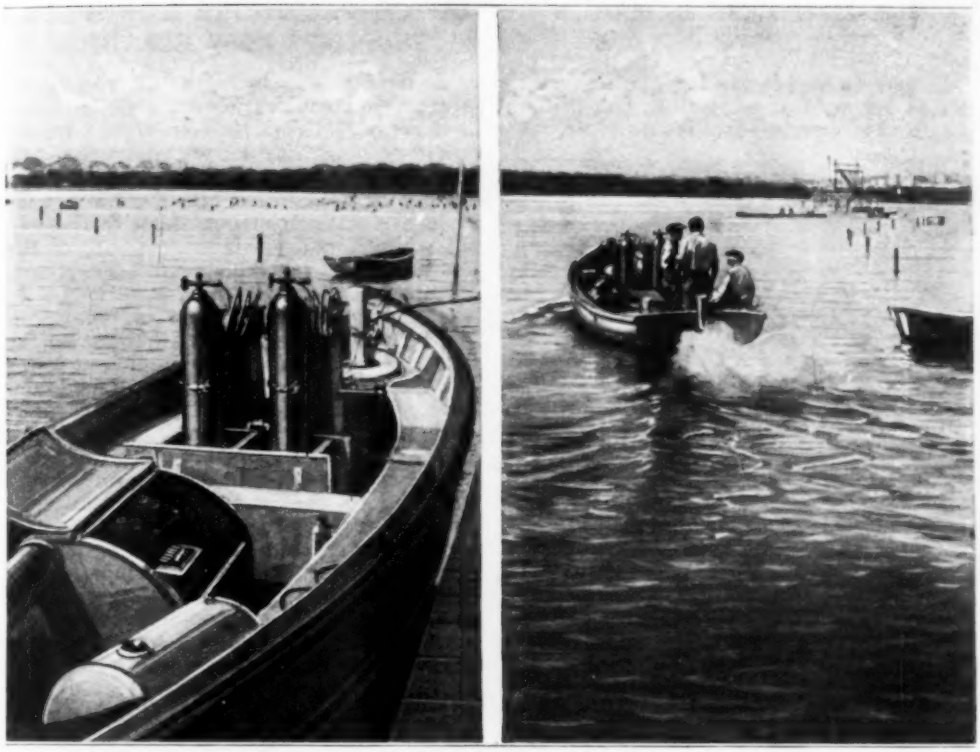
MINNEAPOLIS MAIL CARRIERS MAKE HOUSING SURVEY

A complete survey of housing has just been finished by the post office of Minneapolis, through the mail carriers. This is about the only kind of survey that can be called accurate, because the mail men are supposed to visit every establishment within the city limits.

The plan was simple. Each postman merely recorded the "for rent" and "for sale" signs on his route, classified them according to type of building, and turned in the tabulation to his superintendent. The result of the survey showed 700 places for rent and 1,479 places for sale. This included both old houses and new ones finished but not yet occupied for the first time. There were 1,498 vacant residences, flats, and individual apartments reported, and 3,146 new places under construction, not yet finished. The units under construction were classified as follows: 1,786 dwelling houses, 940 bungalows, 43 buildings containing a total of 243 flats, 7 apartment buildings with 113 apartments, and 47 duplex buildings. When all of these units are completed, Minneapolis will have over 105,700 places of residence of all kinds for families, as an earlier survey, completed Jan. 1, 1921, showed a count of 102,524 residence units then in existence. This is an average of not quite four persons to a dwelling, as the population of Minneapolis was 380,000 according to the 1920 census.

Neither this survey nor the earlier one, which was also made by mail carriers, included any of the so-called family hotels, or large apartment buildings containing a considerable number of "kitchenette" apartments.

¶ The government of Jugoslavia is making plans for an extensive scheme of railroad electrification. This will be done hydraulically, and by the utilization of large lignite deposits in steam plants. By the former means it is hoped to generate 1,000,000 hp., and by the latter, 500,000 hp., the development to be completed within from 10 to 15 years.



The Launch Equipment, Shown at the Left, Consists of Tanks Containing Chlorine Gas, and Others in Which the Gas is Mixed with Water. The Mixture is Used to Purify the Tidewater of a Bathing Beach at Washington, District of Columbia. At the Right, the Launch is Seen Circling the Beach during the Purifying Process

CHLORINE USED TO PURIFY BATHING-BEACH WATER

Chlorine is quite commonly used in purifying drinking water and indoor swimming tanks, but until recently it has been considered impractical to use it to protect bathing beaches affected by tides. Not long ago it was found that infection was being spread through the water of a bathing beach in the tidal basin of the Potomac River, at Washington, D. C. The tide made ordinary purification methods useless. To remedy the situation, two high-pressure tanks of chlorine were mounted on a launch. Water was pumped into cylinders, also mounted on the launch, and there mixed with the chlorine, whereupon the mixture was pumped back into the basin, as the launch circled and crossed the beach. This was done during the time the beach was closed to bathers. The impurities were so thoroughly removed that bathing was made entirely safe, according to the health officials, and reports of infection, which has been traced to the water of the beach, are no longer made.

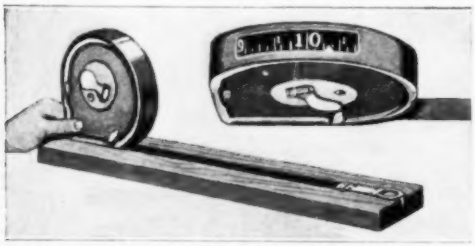
STRETCHABLE KEY-RING CHAIN A USEFUL NOVELTY

Janitors and others who are constantly reaching into their pockets for rings of keys, will be benefited by a new key-ring chain. It is made of coiled piano-wire spring links, and when pulled, stretches. A patented clasp that holds the chain to the belt of the user, safeguards against its loss. The chain will stretch an ordinary arm's length without pulling apart.

¶A French scientist claims that vegetable oils deprived of water and hydrogen and passed over nickel furnish a motor fuel similar to gasoline.

ONE-MAN TAPE IS HANDY MEASURING DEVICE

A new form of steel tape which eliminates the need of more than one man in measuring operations, is now on the

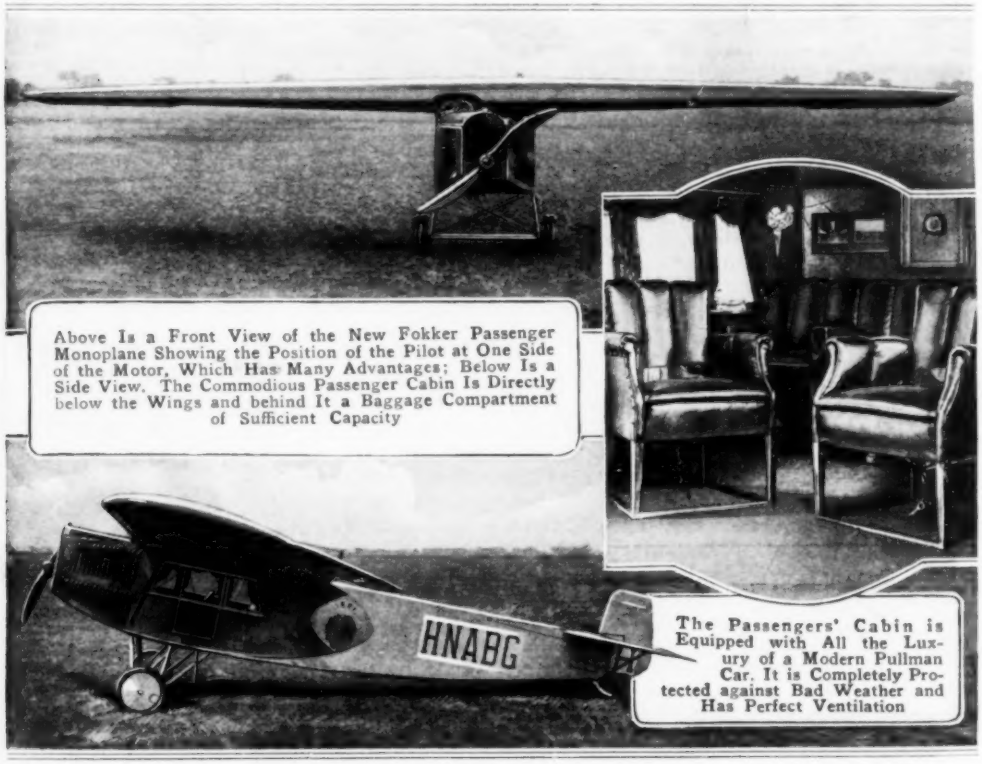


The Hook at the Outer End of This Tape Measure Permits One-Man Operation, and as the Tape is Reeled Off, the Measurements Are Visible through an Opening in the Upper Edge of the Case

market. It consists of an ordinary steel tape housed by a square-heeled case and equipped with a hook at the outer end. In measuring, this hook part is laid over one corner of the object and the case drawn back. The tape can be locked in position by the adjustment of a finger-operated cam, and the length laid off noted through an opening in the rim of the case.

DUTCH PASSENGER MONOPLANE DISPLAYS NEW FEATURES

A new Fokker airplane has been designed to meet the demands of commercial service. This ship is of the monoplane type, with cantilever wings, and carries five passengers, a pilot, and five hours' supply of fuel. A single engine is used with a tractor propeller offset to the left. The pilot's cockpit is at the side of the motor, a position which has been proved advantageous by practical experience. In case of an accident there is no danger of the motor being driven back onto the pilot, visibility is greatly improved in all directions, the motor can be watched continually, and the engine controls are short and simple. A wind screen, fitted in front of the pilot's seat, eliminates all draft. There is a large cabin directly under, and attached to, the main spars of the wing, and baggage space is provided behind it. The construction is of steel tubing throughout, except in the wings, which are entirely of wood. The wing covering is of three-ply wood, and is completely waterproofed. A special treatment is given if the plane is to be used in tropical climates. The fuselage is covered with "doped" cloth.



Above Is a Front View of the New Fokker Passenger Monoplane Showing the Position of the Pilot at One Side of the Motor, Which Has Many Advantages; Below Is a Side View. The Commodious Passenger Cabin Is Directly below the Wings and behind It a Baggage Compartment of Sufficient Capacity

The Passengers' Cabin is Equipped with All the Luxury of a Modern Pullman Car. It is Completely Protected against Bad Weather and Has Perfect Ventilation

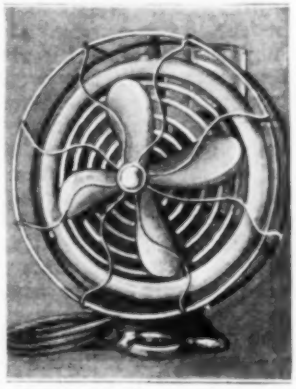
The Corner of a Springfield, Massachusetts, Hotel as It Appeared After Three Electric Freight Cars had Jumped the Track and Plowed through the Walls of the Building: The Early Morning Crash Threw Many of the Hotel Guests from Their Beds, but No Serious Injuries Occurred Even to the Crew of the Cars

RUNAWAY ELECTRIC FREIGHT CARS WRECK BUILDING

Three electric freight cars jumped the track in Springfield, Mass., not long ago and crashed into a hotel, knocking the entire corner out of the five-story building. The train started to run away at the top of a hill and failed to respond to the brakes. When it hit a switch at the corner where the hotel is located, it left the tracks and plowed through the building. The walls of two rooms on each floor were torn entirely away and the whole building so badly shaken that it may be necessary to tear it down. In spite of this, no one was killed or seriously injured. The motorman was thrown from the cab of the forward car and escaped practically uninjured. A freight messenger in the second car was pinned under 20 ft. of wreckage, but was only slightly hurt. The accident happened early in the morning and many of the hotel guests were thrown from their beds. Only one received any injuries, and they were not serious. Fortunately few people were on the street at that hour, or the accident would in all probability have had much graver results.

FAN ATTACHMENT COOLS AIR AND INCREASES HUMIDITY

A means of cooling the air and increasing its humidity is provided by a new attachment to be used on electric fans. It consists of a series of perforated aluminum rings placed back of the fan blades. The last ring is concave and perforated only in the center throughout its circumference. Water is piped to the inner ring and the centrifugal force produced by the fan forces a fine spray through the perforations onto the next ring. This operation is repeated from ring to ring, forming a fine mist between each pair. The air current takes up particles of water which increase the humid-



ity of the room. The action also results in rapid absorption of heat and consequent cooling of the air.

GIANT TREE DEDICATED TO UNKNOWN DEAD

A living memorial, distinctive and majestic, and different from any other that has been dedicated since the World War, was unveiled recently in Yosemite Na-

A Tablet at the Foot of One of California's Big Trees, Which has Just been Dedicated as a Living Memorial to the Nation's Unknown Dead in the World War

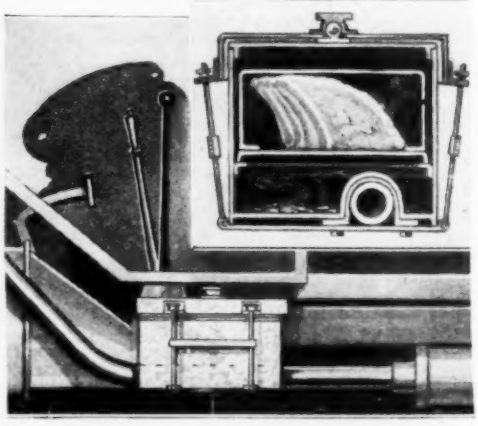
tional Park. It is a tablet of bronze set at the base of one of California's famous big trees. This giant of the forest, towering above the ordinary timber that surrounds it, stands henceforth as "a memorial to the unknown dead" who gave their lives in the great war. A peculiarly fitting ceremony marked the unveiling of this tablet. Water from the crystal-clear stream of the Merced that flows through the park was sprinkled upon the tree and the tablet, to symbolize the purity of the devotion of the men who died in the war and whose names remain unrecorded. The rock at the foot of the tree on which the tablet was placed was taken as a symbol of the permanence and strength of the principles for which the men fought, and the tree, which it is hoped will live through generations, was cited as emblematic of the living and growing gratitude of the nation for the supreme sacrifice made by its sons in the war.

EMERGENCY LAMP IGNITED WHEN OTHER LAMPS FAIL

The electric wiring in any building or steamship is subject to damage, and in the case of a lighting circuit, often just when the lights are most needed. For use on such occasions an emergency lamp has been designed in Germany. It is used in connection with an ordinary electric lamp, and is connected with a four-volt storage battery in such a manner that the moment the current to the regular lamp is cut off, the emergency lamp is switched on.

EXHAUST WILL COOK MEALS FOR MOTORISTS ON ROAD

Hot meals on the road, for motor tourists and truck drivers, are made possible by an exhaust-pipe cooker. A tightly closed box is designed to fit under the driver's seat and can be connected with the exhaust pipe of any automobile. A food container holding from four to six quarts is placed inside. This container is divided by a tray so that more than one kind of food can be cooked at a time. A

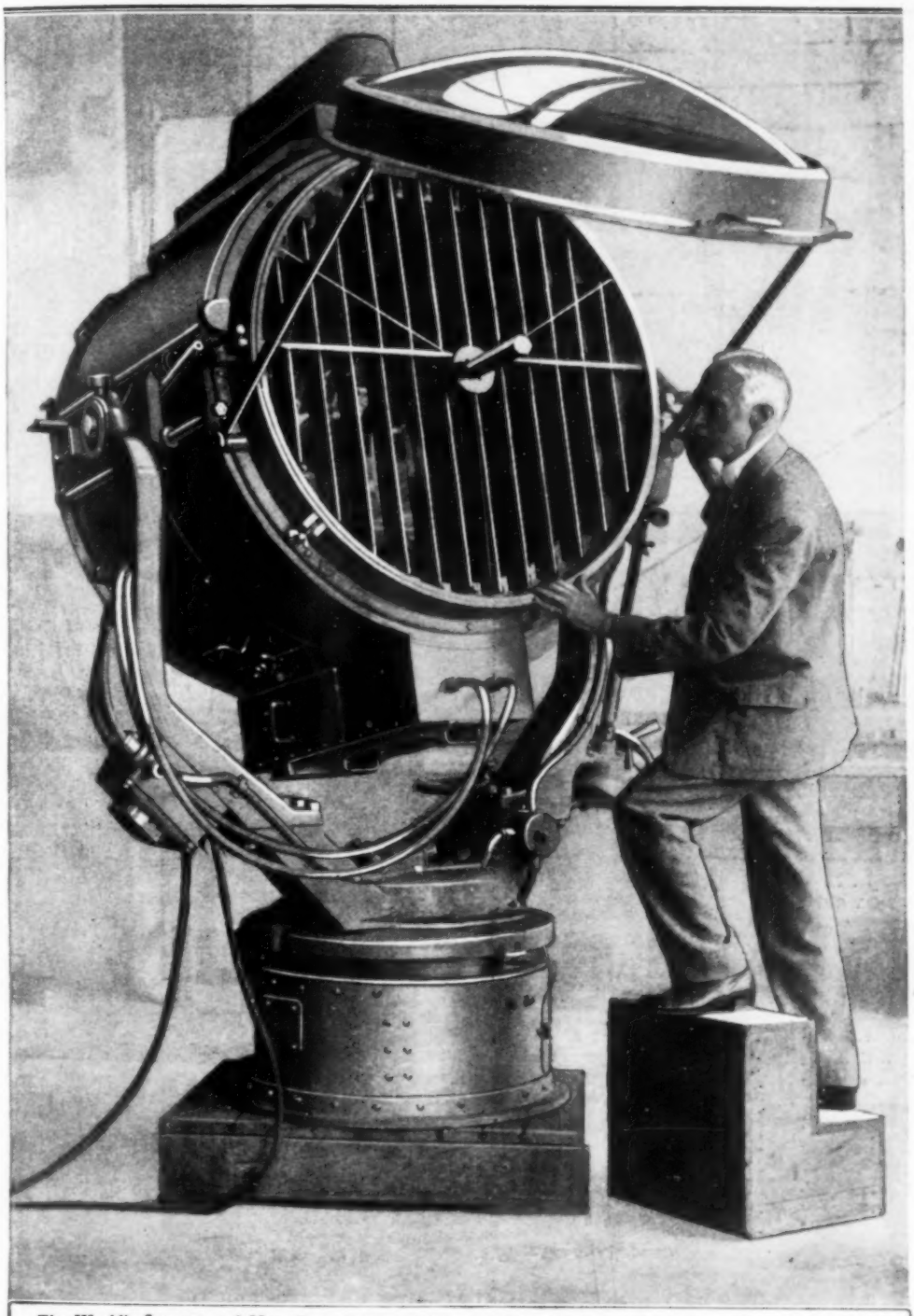


Direct Connection with the Automobile-Engine Exhaust Furnishes Heat for a Cooker, the Design of Which is Shown in the Insert

meal placed in the cooker at the start of a trip is cooked and ready to serve hot when mealtime arrives.

¶At present, London has a total electrical supply of 500,000 kw. from all sources. It is now proposed to construct one great central station with an ultimate capacity of as much as 600,000 kw., which would certainly dominate the electrical industry in that city for years to come.

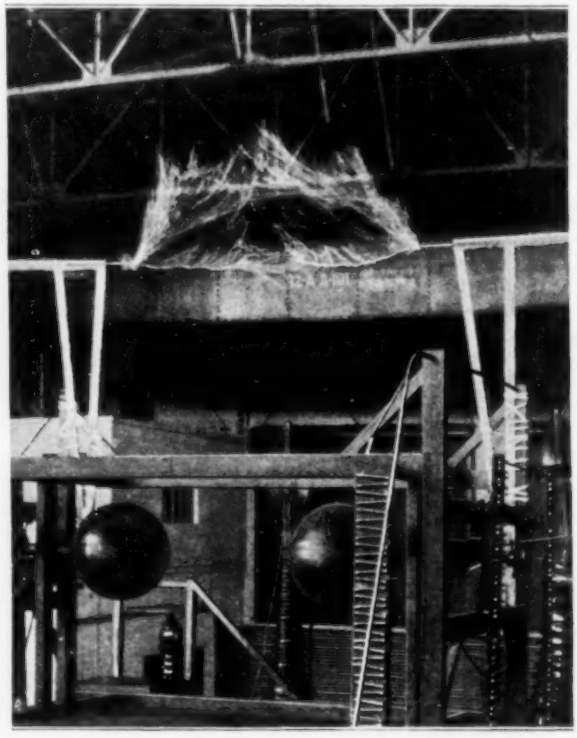
WORLD'S LARGEST, MOST POWERFUL SEARCHLIGHT



The World's Largest and Most Powerful Searchlight, with Its Inventor, Elmer A. Sperry, Standing beside It: It Is a High-Intensity, Anti-Aircraft, 60-Inch Fortress-Type Searchlight for Use in Coast Defense. Its Arc Throws a Light Beam of 1,200,000,000 Candlepower with a Brightness 500 per Cent Greater Than Any Previously Available Light

ONE-MILLION-VOLT CURRENT TRANSMITTED SUCCESSFULLY

At the experimental plant at Pittsfield, Mass., in the equipment of which the General Electric Company spent nearly $1,000,000, experiments in high voltage have been carried on until they have at length culminated in the successful transmission of a 1,000,000-volt electric current. The actual transmission was for a short distance only, within the building, but it was sufficient to indicate the feasibility of transmitting electrical energy far greater distances than have hitherto been considered practical. A power plant is now under construction in California which will carry current for a distance of 250 miles, which is at present a record, but this experiment proved that power transmission might reasonably be considered possible over 1,000 miles.



Some of the Equipment Used in the Transmission of a 1,000,000-Volt Current in the General Electric Company's Laboratory, at Pittsfield, Massachusetts: At the Top is Seen the Arc Produced by the Current in Jumping a Nine-Foot Gap between Two Needle Points. Below Is Another Gap, with Spherical Terminals, across Which the Current was Also Made to Jump during the Tests

During the experiments the 1,000,000-volt current was caused to jump a needle gap of 9 ft. Arc tests were made on strings of standard 10-in. suspension insulators, with some very startling results.

FIGHTING ORCHARD THIEVES WITH A PHONOGRAPH

Since the great increase in automobile touring, farmers all over the country having unprotected fruit close to the road have been greatly annoyed by petty thievery by the tourists. It is not only the amount of fruit stolen, but also the destruction done to vines and plants.

One farmer, however, devised a most efficient method of keeping the tourists out of his orchard. His grapevines and peach trees were close to the road and some distance from the house, although in plain sight of it. He rigged up an old talking machine inside an unused beehive. He then had a record made of two tormented collie dogs barking violently. The phonograph was then electrically connected to the house, so that the turning of a switch there caused the "dogs" to "bark" as long as desired. A storage battery furnished current for the outfit and, by means of a homemade device, the reproducer was automatically reset to the start when it had reached the end of the record.

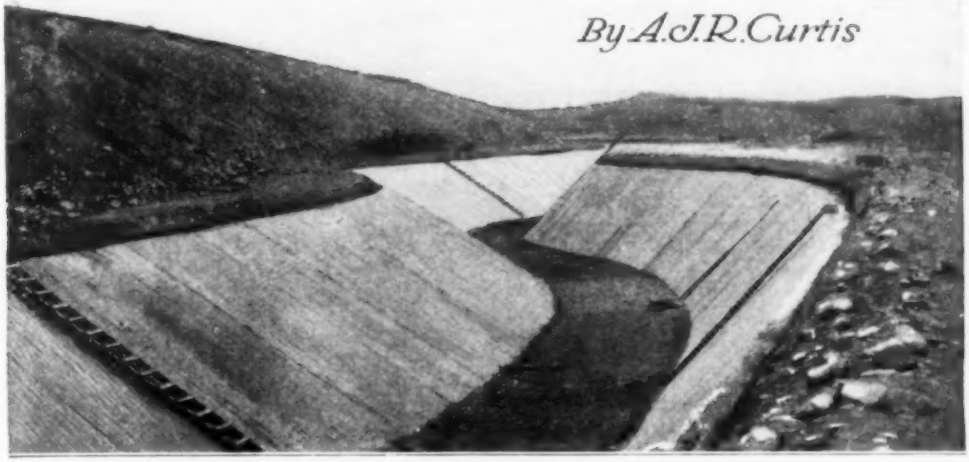
Now, whenever a prospective purloiner of fruit stops his car at this orchard, just as soon as he is seen from the house, the "dog music" is set loose.

The farmer says that this method has never failed to work and there is pleasure in watching the discouraged tourists jump back into their cars and speed away. He claims his "dogs" are better than real ones, as they never bite and there is no license to pay for them.

¶There is projected a storage reservoir, with a capacity of 257,000 acre-feet, that will control the flow of the Chippewa River during the whole year. Water will be stored, by closing the gates, during the high-water period from March to July, to be released during the rest of the year. It will be utilized in power plants below the dam in Minnesota and Wisconsin.

CONCRETE IN IRRIGATION SYSTEMS

By A. J. R. Curtis



With Concrete Sides and Floor Built Like the Pitched Surfaces of Race Tracks, the Great Irrigation Canals of the Pacific and Plains States Bring a Never-Failing Supply of Water to Former Desert Regions

RECLAIMING over 3,000,000 acres in the West, creating vast tillable areas where once were desert wastes, is an achievement for which unusual credit is due to the United States Reclamation Service. The above figure includes only the 31 great irrigation projects in 15 states, and takes no account of numerous smaller projects to impound and distribute water, completed by private initiative.

The government reclamation work has been done, so far as possible, in a permanent manner. It includes over 12,000 miles of canals and 100 dams, and required the handling of 174,000,000 cu. yd. of earth. The cost totals over $127,000,000, but the crops raised in a single year on the reclaimed area already under cultivation (40,000 farms) were valued at over $88,000,000 in 1919.

Concrete has been employed very satisfactorily, and therefore extensively, in these government irrigation systems for canal and ditch linings, bridges, dams, gateways, and other necessary structures, being found practically indispensable in the construction of permanent systems.

The two major structures in irrigation work are the dam to impound the water, and the canal to distribute it. The former is for economic reasons nearly always of concrete and, if of large size, requires a vast quantity of material. The canal, no less important than the dam, has often constituted the weak link in the system. Built with earth walls, the speed of the water through the canal must be slow, and the curves laid out on extremely long radii, or there may be excessive scouring with the choice of high maintenance costs or relatively early destruction. Even well-maintained earth canals have been found by scientific investigation to allow excessive quantities of water to escape through seepage. The Department of Agriculture estimates that as much as 40 per cent of the water entering the canals is sometimes lost from this cause. So the earth-lined canal is likely to prove only a 60-40 proposition from a standpoint of water delivery, and the value of the water saved in a concrete-lined canal is usually sufficient to justify the extra cost several times. The concrete lining makes it possible to carry water at very high velocities and around relatively sharp curves without scouring. The lined canals are free from undergrowth, a frequent and expensive difficulty with unlined canals.

The simplest type of canal lining may be described as resembling, when completed, three parallel concrete roads, the center one laid flat and the outside ones laid at an angle of probably 45° or more, forming the container. The sloping sides have many advantages, among them being the ability to relieve ice pressure. In ordinary practice, these slabs are heavily

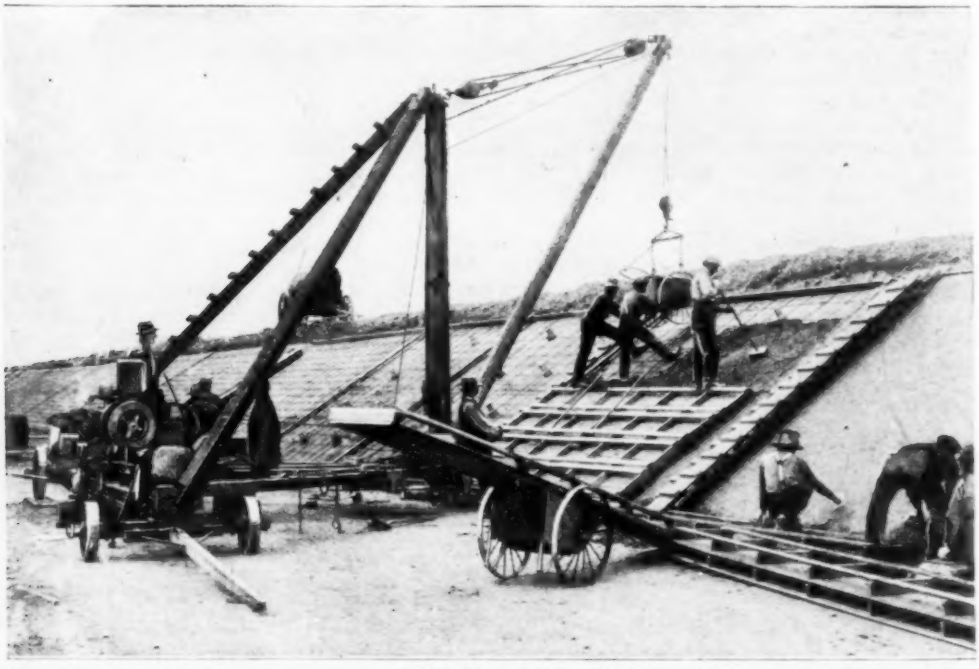
reinforced, since it is often necessary to lay them on considerable fills, where heavy pressures, irregularly distributed, must be taken care of. In some instances and for special reasons canals are built with vertical walls, constructed after the floor, but tied in by heavy reinforcing.

Smaller canals and flumes are occasionally constructed of precast concrete sections. These sections bear some resemblance to the large bell-end concrete pipe, so commonly used in sewer work. They are conveniently molded in steel molds on the site. Smaller lines commonly use concrete irrigation pipes which are put below ground out of the way. The pipe units are usually supplied with tongue and grooved ends and are sealed with cement-mortar joints.

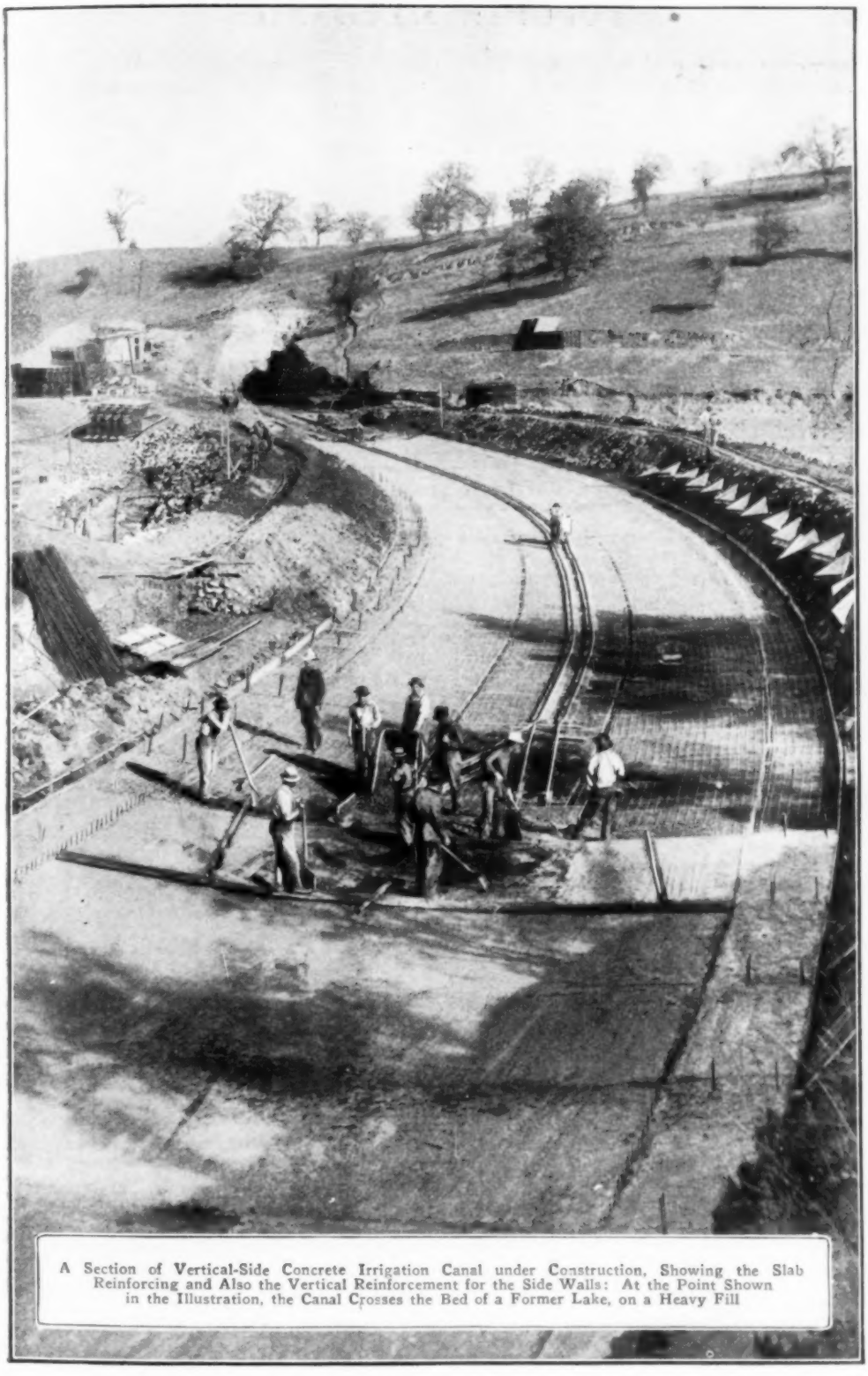
The Canal, Shown under Construction on the Opposite Page, Completed and in Use

These lines are often built in sections of the country where winters are not severe, and the pipes, being covered with earth and constantly filled with water subject to only slight temperature variation, are sometimes safely laid without special expansion joints. Since the expansion joint allows a certain amount of creeping and other movement without damage to the line, it is a desirable construction, even where considered unnecessary so far as temperature changes are concerned. Expansion joints of a number of types are in use, many of them employing an asphaltic or similar filler.

From the great irrigation canals just described, the water is led into smaller feeder lines, each of which supplies many farms. Each farm or ranch has its own intake and gates through which the water is admitted as required to the field lines. The field lines may be opened and closed at will by means of gates, and water may be restricted to certain field ditches as desired, by plugging up the line openings



Construction View of Canal Shown on the Preceding Page: The Methods Used Are Substantially Parallel to Those Employed in the Construction of Concrete Roads. The Surfaces Receive a Smooth, Impervious Finish



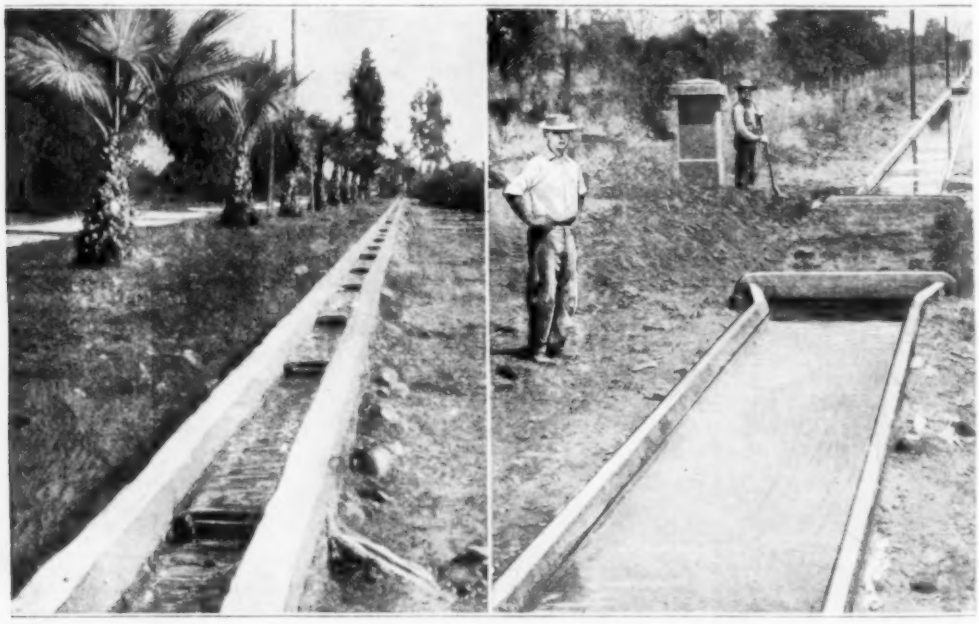
A Section of Vertical-Side Concrete Irrigation Canal under Construction, Showing the Slab Reinforcing and Also the Vertical Reinforcement for the Side Walls: At the Point Shown in the Illustration, the Canal Crosses the Bed of a Former Lake, on a Heavy Fill

A Colorado Irrigation Canal Built Entirely of Precast Concrete Sections: For the Smaller Canals, This Method is Often Preferred to That Shown in the Preceding Illustrations

with earth. These small lines are generally constructed by the farmers themselves, or by local coöperative irrigation associations and companies, which invariably follow up the work of the United States Reclamation Service.

TABLE SHOWING THE RELATIVE VOLUME OF WATER CARRIED IN ONE HOUR IN LINED AND UNLINED CANALS

Dimensions		Gradient of Canal	Volume of Water Cu. Ft. per Hour		Volume of Water Acre-Ft. per Hour	
Width of Bottom	Slope of Sides	Per Cent	Concrete Lined	Unlined	Concrete Lined	Unlined
2 feet	45°	.001	604,800	86,400	13.8	1.98
4 "	45°	.001	828,000	115,000	19.0	2.64
6 "	45°	.001	1,123,000	144,000	25.8	3.30
8 "	45°	.001	1,404,000	173,000	32.2	3.97



Left: A Farm Lateral, Showing Openings through Which the Water is Supplied to the Field Ditches. Right: Typical Irrigation Ditch Fed from the Main Canal and Used for Conveying the Water into the Individual Laterals. Driveways are Carried over the Ditches on Reinforced-Concrete Slabs

MACHINE TESTS SHRINKAGE IN FABRICS POSITIVELY

In the manufacture of cloth it is essential to know the exact amount of shrinkage it will undergo in the process of finishing, so as to result in the required width. Hitherto this has been altogether a matter of guesswork. Recently there has been produced in England a mechanical device for testing shrinkage in cloths positively. The efficiency of the machine may be judged by the results shown in authenticated tests. In worsted costume cloth the estimated shrinkage shown by the machine was exactly the same as the actual shrinkage. In woolen costume cloth it was very nearly exact, and in such fabrics as milled Austrian rug, and mixture worsted coating, there was never more than a difference of from 1 to 2 per cent. Tests with heavily milled beaver showed a difference of 6 per cent. It is stated that the machine, besides determining the shrinkage of a fabric, can be used also for ascertaining the elasticity of rubber, and the breaking strains of fibers of 3 in. and over.

FAT PERSONS NOT ALLOWED IN SEQUOIA PARK CAVES

A recent order, by which all persons having a waist measure of more than 33 in. are until further notice excluded from the Crystal Caverns, one of the famous attractions of the Sequoia National Park, California, has its explanation in a recent accident of curious nature. A man of more than average girth attempted to enter the cave, which is reached through a narrow crack between the rocks. He succeeded in pushing in, but reached a point where he could neither go ahead nor turn back, and was held a prisoner between the rocks. After three days without food, he had lost enough weight to enable forest rangers to free him by chipping away the rocks around him. The cave entrance is now to be widened sufficiently to prevent the repetition of such an accident.

PHOTOGRAPH-PRINTING DEVICE MAKES RAPID WORK POSSIBLE

A new machine enables an operator to make 1,500 prints an hour, from one photographic negative. By turning a thumbscrew, a mask on the machine is adjusted to accommodate any size of negative. The machine is operated by a pedal which disconnects the red guide light and turns on four 100-watt printing lamps. The number of the print is automatically stamped on the back of the paper at the same time. When the pedal is released, the printing lamps are disconnected, and the red lamps lighted. The print is then removed.

This Machine, Which Prints 1,500 Pictures an Hour from One Negative, can be Adjusted to Accommodate a Negative of Any Size. It is Operated by Pressing and Releasing the Pedal. The Insert Shows the Arrangement for Receiving the Negatives and Paper

LEATHER-MOUNTED MAGNIFIER WILL STAND ROUGH USAGE

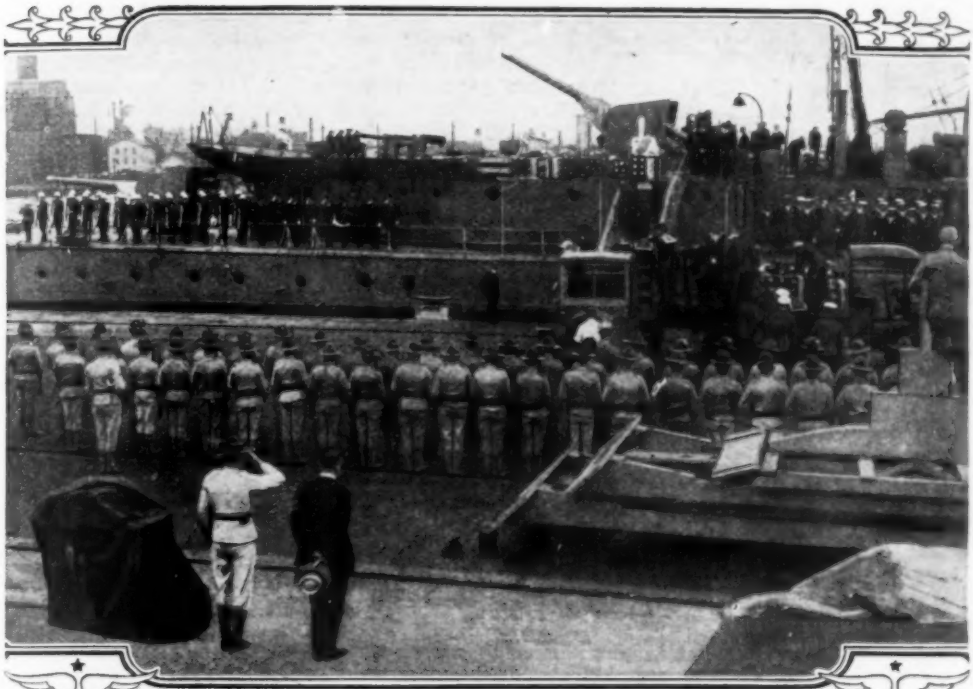
A magnifying glass which can be given a great deal of rough use without danger of breaking is being made especially for persons in professional and industrial positions where the work subjects them to great eye strain. The lens is mounted in leather, which protects it if dropped and forms a convenient means of handling.

THE WRECKAGE OF THE GREAT AIRSHIP "ZR-2"

The Wreckage of the "ZR-2" in the River Humber, at Hull, England, Following the Accident on August 24, in Which 16 American and 30 British Sailors Lost Their Lives. When the Giant Airship Sank Rapidly in the River; This Is Probably the Best Photograph Obtained of the Wreck. The Torn Gas Bag and Twisted Girders can be Seen Clearly. It is Supposed That the Giving Way of Weak Girders Caused the Accident

PHOTO BY CENTRAL NEWS

AND NAVAL HONORS FOR THE AMERICAN VICTIMS



The Bodies of the American Victims of the Disaster were Brought to This Country by the British Cruiser "Dauntless" and Met by a United States Naval Escort. The Flag-Draped Coffins were Brought Ashore at the New York Navy Yard, Brooklyn

The Funeral Services at the New York Navy Yard, on September 17, were Attended by Secretary of the Navy Denby and Other High Officials, as Well as Representatives of Several Foreign Governments. The Dead Heroes were Accorded the Full Naval Honors Due to Those Who Give Their Lives in the Line of Duty

PHOTOS BY INTERNATIONAL

The Wreckage of the "ZR-2" in the River Humber, at Hull, England, Following the Accident on August 24, in Which 16 American and 30 British Sailors Lost Their Lives, When the Giant Airship Sank Rapidly in the River: This Is Probably the Best Photograph Obtained of the Wreck. The Torn Gas Bag and Twisted Girders can be Seen Clearly. It is Supposed That the Giving Way of Weak Girders Caused the Accident

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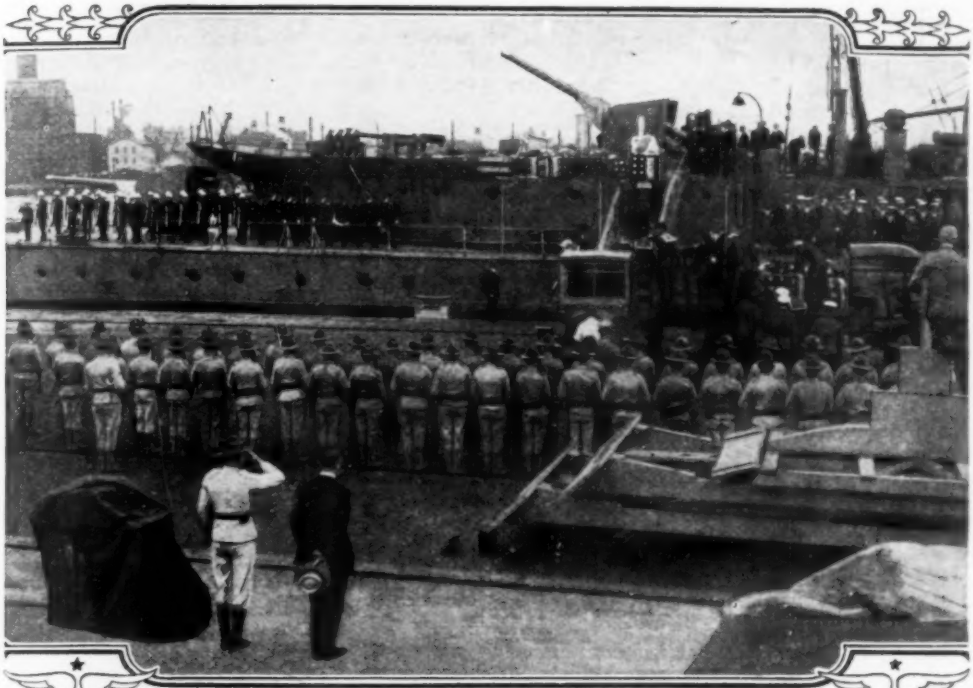

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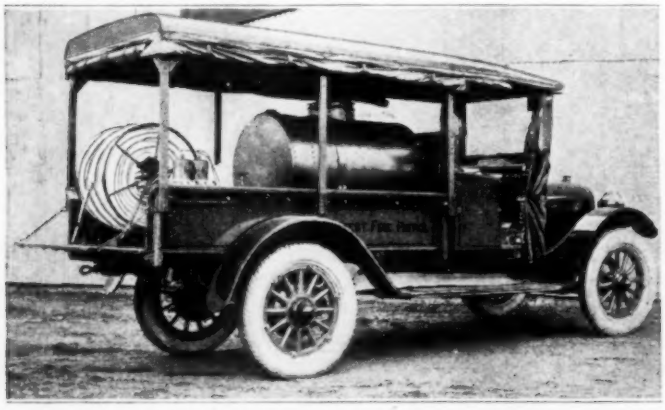
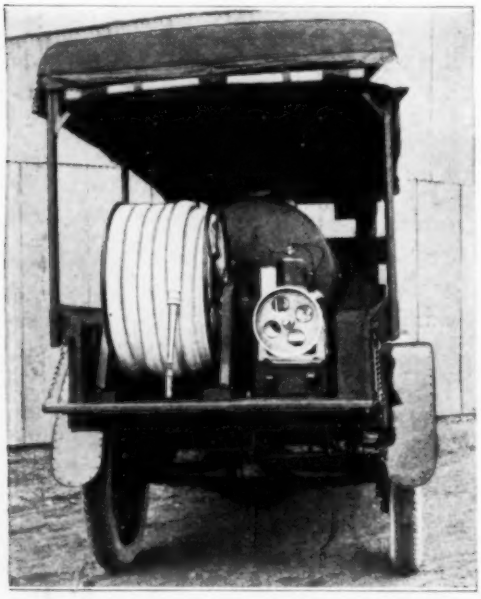
PHOTOS BY INTERNATIONAL

TRUCKS FIGHT FOREST FIRES IN DANGER AREAS

A new form of fire-fighting apparatus has been adopted by the U. S. Forest Service for use on what is known as the "blow-down area" of the Olympic Peninsula, Washington, where approximately six billion feet of heavy timber was laid low in a terrific hurricane during the winter of 1920-1921, as described in the May issue of this magazine, and which ever since has been carefully guarded to check the spread of forest fires.



A ¾-Ton Truck Equipped for Fighting Forest Fires in the Olympic Peninsula, Washington, Where Six Billion Feet of Timber, Blown Down Last Winter, Make Forest Fires Particularly Dangerous



The Equipment of These Trucks Consists of a Water Tank, Hose, and Pumping Engine, besides the Tools Commonly Used in Fighting Forest Fires

The apparatus consists of ¾-ton automobile trucks equipped with a 2½-hp. gasoline pumping engine, a 300-gal. water tank, hose reel, 1,000 ft. of hose, two crosscut saws, axes, hazel hoes, shovels, sledges, and wedges.

A fire was reported one evening to district headquarters on this area, and the run was made by one of these machines a distance of 25 miles in 40 minutes over a road unfamiliar to the patrol. A few minutes later two additional trucks arrived. Summarizing, 50 minutes after the fire was reported, three streams of water were playing on it. This of course would not be considered a record time for a city fire department, but it must be borne in mind that the roads traversed are rough, very little used mountain roads, and the distances great.

WAVE-LENGTH MEASUREMENTS IN RARE-GAS SPECTRA

In the experimental work connected with the comparisons of wave lengths that has been carried on for some time by the U. S. Bureau of Standards, their most recent experiments have been concerned with measurements in the spectra of the rare gases argon, krypton, and xenon. This is a continuation of similar work that has been done in the past on the spectrum of neon, particulars of which have been published. The experiments have shown that the spectra of these inert gases contain strong lines which represent wave lengths of great uniformity, capable of easy reproduction, and therefore suitable for use as standards. The refinement of the methods and instruments used by the Bureau of Standards in these experiments is evidenced by the close agreement between values obtained by different observers.

TWO YEARS' OPEN BOAT TRIP BY THREE WAR VETERANS

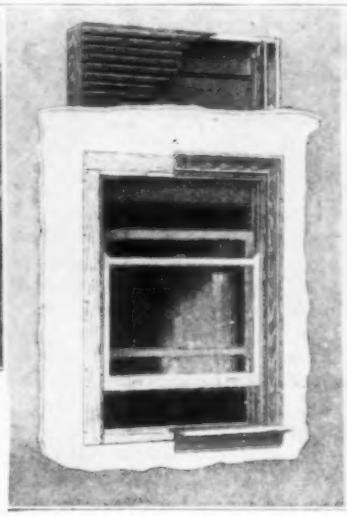
From Halifax, N. S., to Vancouver, B. C., via the Panama Canal, in a 15-ft. boat, sounds like a pretty bold undertaking. Furthermore, the trip is to be made without carrying any food, bedding, or

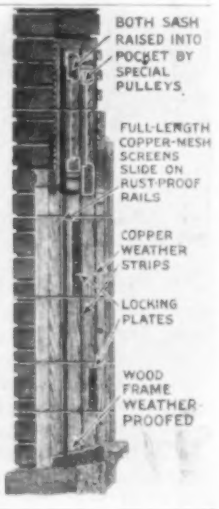
These Three Canadian War Veterans, in This 15-Foot Boat, Rigged with Small Jib and Sprit Sails, Are on a Journey from Halifax, Nova Scotia, to Vancouver, British Columbia, Which is Expected to Last Two Years. They Carry No Food and Very Little Baggage, Intending to Put Ashore for Meals and Sleep

covering aboard the boat. The adventurers, who are already under way, are three veterans of the Canadian Expeditionary Forces, who saw service in France, and appear not yet to be tired of "roughing it." They carry no firearms, or fishing tackle, and scarcely any baggage, their intention being to hug the coast, and go ashore for meals and sleep. The trip is expected to last two years. The journey will be much lengthened by having to follow the coast line so closely.

DOUBLE-SASH WINDOW FRAMES WITH SCREENS AND BOX HEAD

A combination of a window in single or double sash, and a screen covering the whole opening, so constructed that the window can be entirely opened, or the screen entirely removed at any time, is now on the market. The windows, including the whole frame, the sash, and all fittings, are manufactured and shipped ready to be set in the walls as building




BOTH SASH RAISED INTO POCKET BY SPECIAL PULLEYS
FULL-LENGTH COPPER-MESH SCREENS SLIDE ON RUST-PROOF RAILS
COPPER WEATHER STRIPS
LOCKING PLATES
WOOD FRAME WEATHER-PROOFED

Window Frames with Screens, Sash, and Box Heads Built as a Unit: Above, They are Seen being Built into a New Wall; Immediately to the Right Is an Outside View of One, Showing Relation of All Parts, Which, Farther to the Right, are Described by Notations

proceeds. Besides the ordinary sash and window frame, it is fitted with a copper-wire screen, and it contains above it a box head into which the sash and screen can be raised, leaving the window opening entirely free of either one or both. The screens, for instance, are stowed away in this box head all winter, and are instantly accessible at any time. In the case of the sash, one can be pushed into the box head, leaving room to wash the other inside and out from the inside of the room, without having to get out on to the window sill. Connected with this outfit, there are a patented ball-bearing sash pulley which is very accessible, and sheet-iron covers on the side of the box head that faces the inside of the room, which serve as lath for plastering. Besides the advantages of inside cleaning and convenient storage of the screens, they are said to be more air-tight, involving, therefore, less cold-air leakage and heat loss in winter.

MODIFIED STEREOPTICON FEATURE OF THEATER

By HORACE E. THOMAS

NEW uses for the stereopticon, and improvement in its ordinary use, are made possible by ingenious devices that have been developed by the manager of a large vaudeville theater in Oregon. He does not lay claim to any particular originality in the principles used, but rather to improving and combining old ideas in a machine that is quite different from the ordinary stereopticon.

One of the unusual features of the modified machine is the size of the picture shown. From an ordinary slide it projects with great clearness a picture that completely covers a screen 31½ ft. high and 36 ft. wide. The large size is made possible chiefly by the use of lenses of great magnifying power. It took considerable experimenting to find lenses that could reproduce upon the screen a picture clear in its most minute details, and of the size desired. Even with a lens of sufficient power, however, it is not practical with the ordinary stereopticon to project such large pictures. The heat of the powerful light required melts the photographic film upon the slide in a few seconds. To overcome this difficulty two small glass cells, fed with running water, are installed between the condenser lenses and the slide, forming an adequate protection for the sensitive coating.

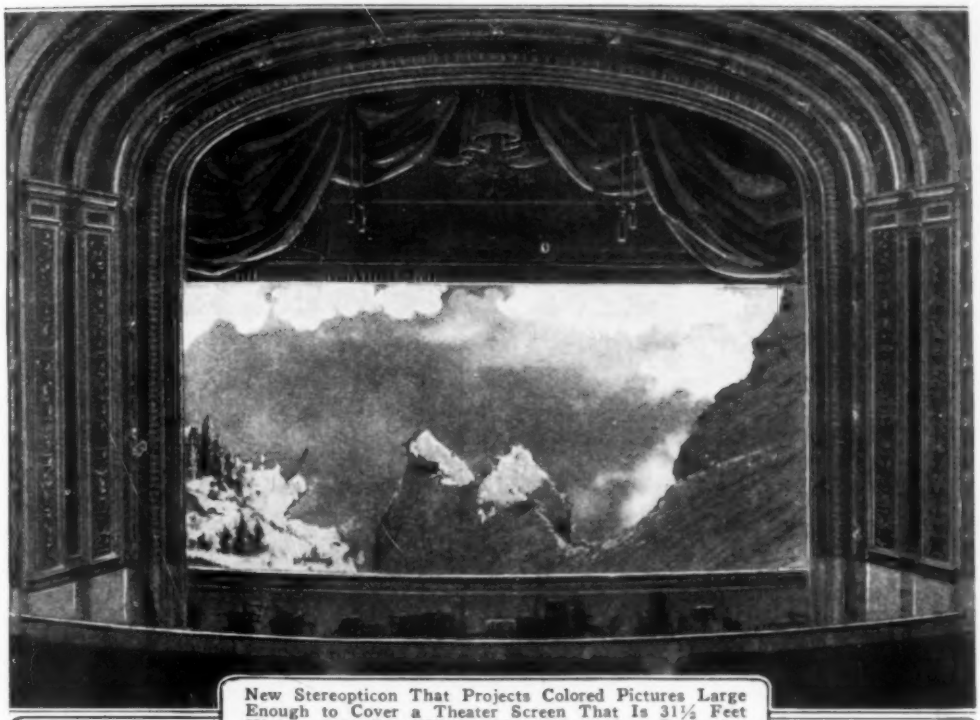
Stereopticons as a rule use electric current of from 15 to 25 amperes. This machine requires 45 amperes. Were it not for the water cells, the intense heat would ruin the slides almost instantly. With them, the same slide can be displayed as long as desired. The inventor, in making his tests, has left one picture on the screen for an entire hour, and at the end of that time the slide was unimpaired.

Other innovations of moment have been made in this super-stereopticon. A stop slide permits the operator to display as much or as little of the picture as desired. When the front curtain on the stage rises, the stop slide is adjusted to keep pace with it. The picture unfolds just rapidly enough to cover the white curtain behind. In effect the audience sees a painting revealed inch by inch with the curtain's ascent. When the exhibition is concluded the stop slide is again used to veil the picture gradually as the curtain falls.

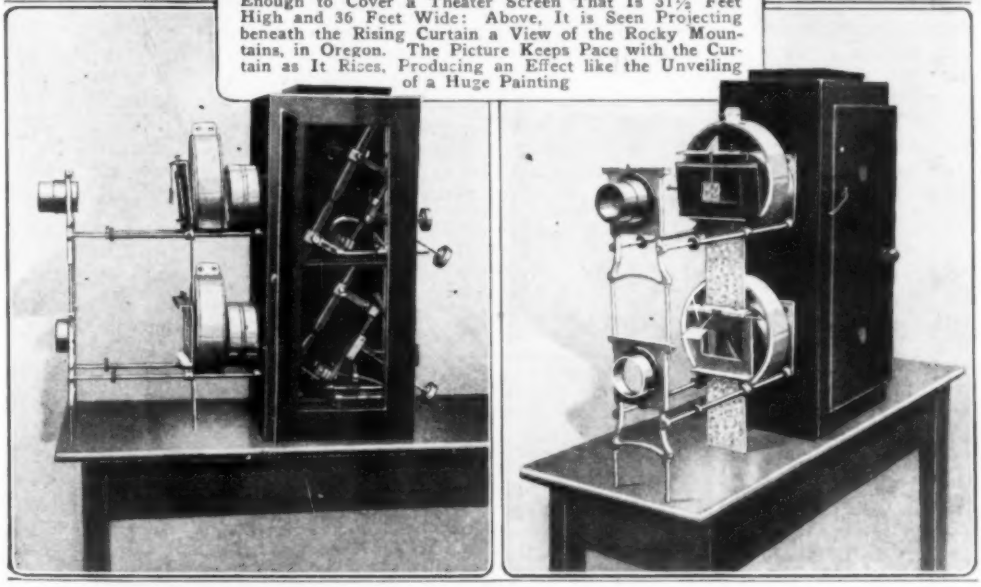
Many uses have already been found for the new apparatus, and still others are in prospect. In themselves, the large colored slides are of great beauty. Then, by darkening a portion of the lens, a panel may be left in the center of the screen for the display of moving pictures. Thus shown, with a colored scenic border, they are particularly effective, and it is possible to change the background picture as frequently as desired.

In this arrangement the inventor sees vast future possibilities. The slide picture may be made to provide a fitting setting or atmosphere for the moving picture. When the film shows a wreck scene, for instance, the border may be a colored replica of a wild storm at sea, or if the motion picture shows a mountain cabin, the view surrounding it may be a majestic forest, and so on, in endless combinations.

Up to date the installation has been used almost exclusively to show outdoor scenery. It is believed by the inventor that it may be utilized in some instances to provide the settings for plays. In certain plays, he believes it is feasible to supply the entire stage equipment of furniture, pictures, doors, fireplaces, etc., as a projected picture. When a singer takes the stage, a fitting background for the song, or the words themselves, may be thrown about him.



New Stereopticon That Projects Colored Pictures Large Enough to Cover a Theater Screen That Is 31½ Feet High and 36 Feet Wide: Above, It is Seen Projecting beneath the Rising Curtain a View of the Rocky Mountains, in Oregon. The Picture Keeps Pace with the Curtain as It Rises, Producing an Effect like the Unveiling of a Huge Painting



Left: Side View of the New Stereopticon. The Carbons of the Two Arc Lights Require a Current of 45 Amperes, Producing So Much Heat That It Is Necessary to Provide Means for Allowing Water to Run between the Condenser Lens and the Slide. Right: Front View of the Stereopticon

Already the new stereopticon has progressed far beyond the stage of an experiment. For months it has been used with great success in the theater where it was originated. There it is used to present Oregon scenery, and as a background for current-event films. Announcements are also flashed on the full-stage picture, standing out like a bulletin board in the midst of a scenic setting.

BEAUTIFUL HOME WITHOUT WALLS OR DOORS

By JOHN ANSON FORD

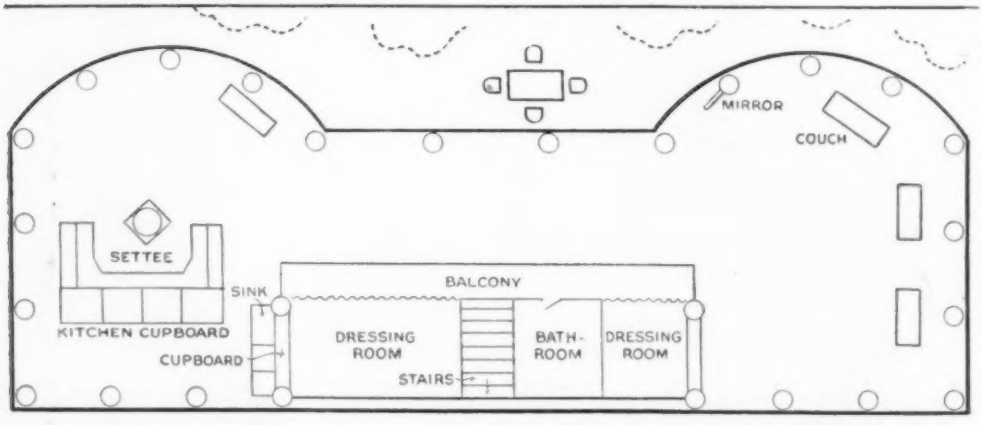
A SPACIOUS and handsome house, without any walls or doors, is the extraordinary dwelling which serves as a home for a Berkeley, Calif., lawyer and family, the latter consisting of the wife and eight children. While such a residence would not be possible in a colder climate, it must be borne in mind that the climate in Berkeley is sufficiently cool in the winter to make some sort of heating apparatus a universal necessity.

The House without Walls Seen from the Front Gate: Shrubbery and Trees Furnish the Occupants with Privacy, Which would Otherwise Be Lacking

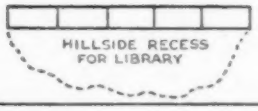
This wall-less house is no makeshift dwelling but substantially and artistically built according to the special design of the mother of the large family, who felt that all concerned would live more natural and healthful lives if unprotected by walls and artificial heat. The health of the entire family and its robust appearance after six years of residence in this home, seem to confirm the mother's judgment.

The home is so unusual that it is not easy to describe it in ordinary architectural terms. It consists essentially of a long concrete floor protected by a roof of corresponding shape and size, supported by beautiful Corinthian pillars of concrete, nearly 18 ft. high. The roof is shaped like a turtleback and is pierced by two large circular skylights, set with transparent glass. These lights are particularly useful when rain or wind requires the letting down of canvas curtains on one or more sides of the house. Taut wires, strung vertically either side of each pillar, serve to hold these curtains in place when unfurled, each edge being set with eyelets through which the wires pass. The curtains are seldom all let down, however, and when they are, there is ample opportunity for the circulation of fresh air at the top, bottom, and sides.

The builder of this extraordinary house did not attempt to do away with heating systems altogether, but what is used is so different from the conventional as to make it almost unique. As has been stated, the floor is of concrete. This is laid over a network of hollow tile which lies only a short distance below the sur-



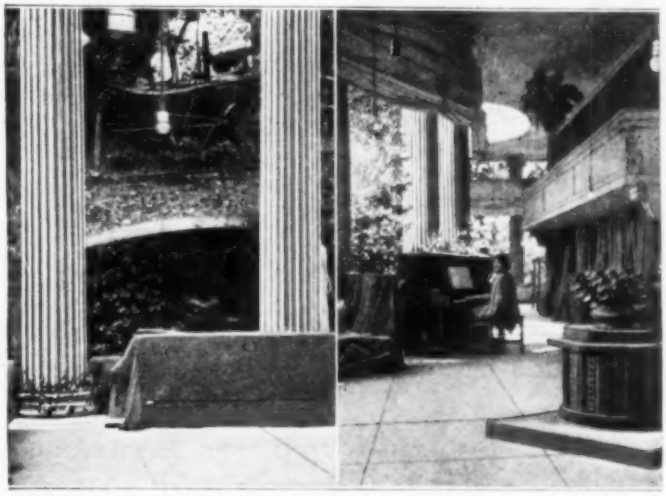
This Sketch Shows the Arrangement of the "Interior" of the House. There Is Only One Floor, but the Dressing Rooms, Separated by Curtains, are Built in Two Tiers. The Bathroom Alone is Provided with Walls. The Location of the Hillside Library Recess in Relation to the Main Building is Indicated at the Right



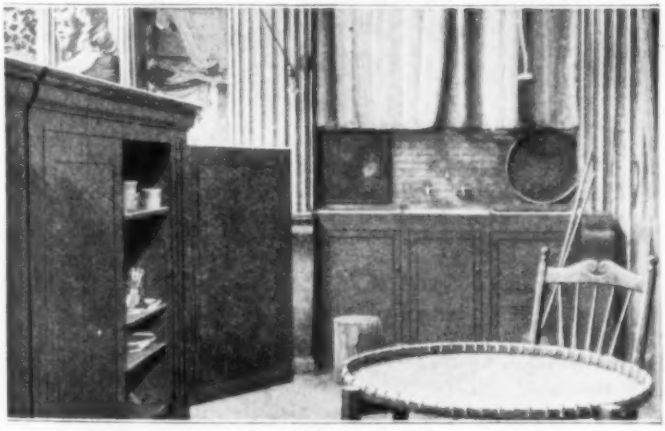
face. This hollow tile is connected to a hot-air furnace located in a basement occupying a portion of the area beneath the house. The passage of air through the hollow tile serves to keep the floor warm, and so supplies heat.

The home is, in effect, one large veranda. While there are no partitions, there has been constructed at one side, midway between the ends, a series of booths or recesses, two tiers high, with openings at the front, across which hang heavy curtains. These are the dressing rooms for the entire family, and here are dressers, mirrors, and other necessary conveniences for making one's toilet. Only one of these compartments has four walls and a door. This is the bathroom. Stairs lead to the second tier of dressing rooms, along the front of which runs a picturesque balcony. The entire family sleeps on divans or couches, which constitute the principal articles of furniture at one end of the home, which end, in the daytime, might be compared to the reception hall or living room.

A large high-backed settee at the opposite end of the house is another important piece of furnishing. The back of this settee



The Location of the Hillside Library Recess, Which Provides a Comfortable Grate Fire Whenever Desired, is Indicated Here. One of the Couches or Divans, Which are Used as Beds, is Shown at the Left. The General View of the Interior, at the Right, Shows the Extreme Simplicity of Arrangement



Above: This Settee Serves as a Partition between the "Sitting Room" and "Kitchen." The Curtains are Lowered for Rain. Left: The Kitchen with Cupboards for Dishes, Sinks, and an Electric Stove

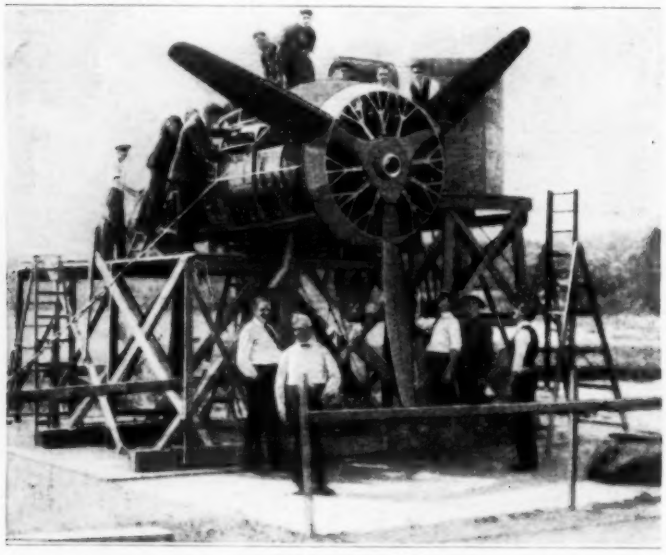
is divided into spacious cupboards, where dishes and a small electric stove are to be found. The end of the structure comprising the dressing rooms, next to the settee, is fitted with sinks, and they, together with the cupboards, just referred to, constitute all there is of a kitchen. The ex-

treme simplicity of the culinary arrangements is accounted for in part by the fact that the entire family lives on a diet of uncooked foods, such as fruits, nuts, salads, and various vegetables, which most persons contend are good only when cooked, but which this family declares are delicious in their natural state. The only exception to the diet of unfired foods is roasted peanuts and a sort of hard-tack bread made in the kitchen. The small electric stove is all that is necessary for this "cooking" and the heating of water for the light dishwashing.

That the members of this household may enjoy the benefits of an open fire, a crude fireplace has been dug out in the rocky side of the hill, only a few feet from the end of the wall-less house, and here, amid the shelter of tall trees and shrubbery, the family often gather on cool evenings. Another retreat, popular with all the family, is a cave in the hillside protected by a heavy door, where the family library and those articles that need protection from the weather are housed. As already indicated the furniture in the home is simple. There being no walls, there is no place for pictures except in the dressing rooms where some choice paintings are to be found. The lack of pictures is made up, however, by the remarkable landscape views which the stately pillars frame in artistic fashion. The house is situated high up on a steep hillside, a location that not only gives the privacy essential to this sort of "open house," but also affords marvelous views of the cities of Berkeley, Oakland, and San Francisco. The piano, which is a much-used article in this household, is protected in inclement weather by a heavy tarpaulin. All the furniture used is finished to withstand a degree of exposure.

MULTIPLE-DRIVE POWER UNIT FOR NAVAL SEAPLANE

The multiple-drive power unit, to be used in the giant seaplane "G B" being built by the navy, has been successfully completed. This unit consists of three 400-hp. Liberty motors installed in a single streamline nacelle and geared to an 18-ft. propeller. Operation with either one, two, or three engines has been successfully demonstrated. The "G B" will be fitted with three such units, giving it a maximum speed of 110 miles an hour and a cruising radius of 3,000 miles. The plane will be operated by six engines, one engine of each unit being held in reserve. The plane will have a wing span of 150 ft. and the boat will be 67 ft. long and 18 ft. in beam. The builders of the power unit claim that the ability to hold one engine in reserve removes the last obstacle to practical long-distance airplane transportation. They guarantee that an all-metal monoplane with such a power equipment will be capable of making 150 miles an hour for 20 hours, with 12 passengers aboard.



One of the Power Units, by Which, the Builders Claim, a 20-Hour Flight from New York to London will Be Possible

¶ In erecting a large building, such as the Federal Reserve Bank of Chicago, the old practice was to plaster over the front of the building with separate signs, of all shapes and colors, each with the name of the subcontractor in each separate branch of work connected with the building. In the case of this new bank building, as there are as many as 64 separate subcontractors, the general contractor had their names all tabulated neatly inside one large frame. After dark, this sign is brilliantly illuminated.

HOMESTEADERS TRAVEL WEST BY MOTOR CARAVAN

The Modern Pioneers Ready to Start on Their 2,500-Mile Trip from Brooklyn, New York, to Buhl, Idaho, Where They will Build New Homes on Irrigated Land, Which They have Purchased in the Snake River Valley

The Caravan, Equipped with "Bungalow Trailers," Camped Out Each Night along the Road. When in Camp, Each Trailer Afforded Weather and Insect-Proof Sleeping Quarters for Six Persons, as Well as Shelter for a Kitchenette. Careful Plans Made the Whole Trip Easy and Pleasant

An automobile caravan of 125 persons left Brooklyn, N. Y., July 28, on an overland trip to Buhl, Ida. Each machine was equipped with a camping outfit, mounted on a trailer. This is the first contingent of a colony of 400 homesteaders who have purchased 5,120 acres of irrigated land and are leaving their city homes to take up agriculture. The others will follow next spring.

When William D. Scott, leader of the caravan, decided to go west, a number of friends asked permission to join his enterprise. He visited the Snake River Valley, secured an option on land and water rights in that vicinity, and started to form a colony. Each family was required to possess a minimum of $3,000 toward its new home, and to be in a position to sustain itself for at least one year, until the first crop would be marketed. A governing board was chosen to administer the affairs of the colony, and the enterprise is being conducted in a thoroughly businesslike way.

Only a few of the colonists have had practical experience in farming, but they will be backed by the Idaho authorities, who have practically guaranteed results. Experts from the Idaho Agricultural College will furnish supervision during the first year. They predict that the colonists will be able to pay out by the end of the third year on the proceeds of alfalfa, onion seed, and potato crops, which are the principal products of the valley.

TOWER OF NEW THEATER STRIKINGLY ILLUMINATED

A new theater, recently opened in Kansas City, Mo., is surmounted by a tower of most striking appearance. The building and tower, the construction of which required 16 months and an outlay of a million dollars, are of concrete, faced with terra cotta. The architecture is especially attractive. The tower, which rises 100 ft. above the street, is beautifully illuminated, and large letters at the top, which spell its name, rotate so that they may be read from any direction.

The Tower of a New Theater in Kansas City, Missouri, Surmounted by a Revolving Illuminated Sign Bearing the Name

TUBULAR PHONOGRAPH NEEDLE RESEMBLES PEN POINT

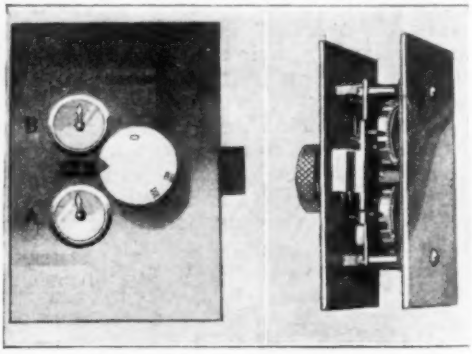
A new type of metal phonograph needle is said to possess all the advantages of other needles with none of their defects. It is a tiny metal tube with a point similar to a pen. The lightness of this needle is supposed to reduce wear on its point and on the record. One needle can be used 500 times. When it is used in the position of a pen in writing, the tones are as soft as those produced by a fiber needle, and clearer. A quarter turn gives tones as loud as those produced by the heaviest steel needle.

TIMING COMBINATION USED ON COMMON DOOR LOCKS

A new lock in which the elapse of a certain predetermined number of seconds is the principal element of safety, is the subject of a recent U. S. patent. The devices by which the lock is operated are visible on the outside of the door to which the lock is fitted, and consist of an indicator in the form of a knurled handwheel, on one side of which is a pointer fixed to the door. Above and below this are two small dials, each graduated into 60 spaces representing seconds, and having a hand like the small hand of a watch. A similar mechanism in connection with each of these allows them to be set so that a necessary number of seconds must elapse in each case, and a different number in each case, in order to open the lock.

The lower one is marked "A," and the upper one "B," and on the face of the indicator are similar marks at two points with a zero mark at another point. Supposing the lower dial has been set for seven seconds, and the upper one for six; in order to open the lock, the indicator is turned to the right, so that first the A registers with the pointer at the left, and is then held there until the A dial shows the elapse of seven seconds, when it is moved to the B, and when the B dial has shown the elapse of six seconds the lock will open. To lock it, the indicator is turned back till the zero registers with the pointer.

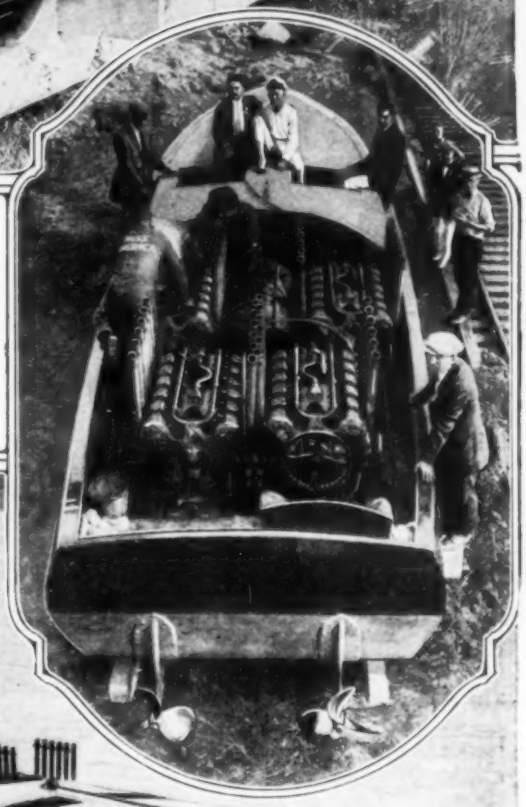
The combination can be used on common door locks besides those of safes and vaults.

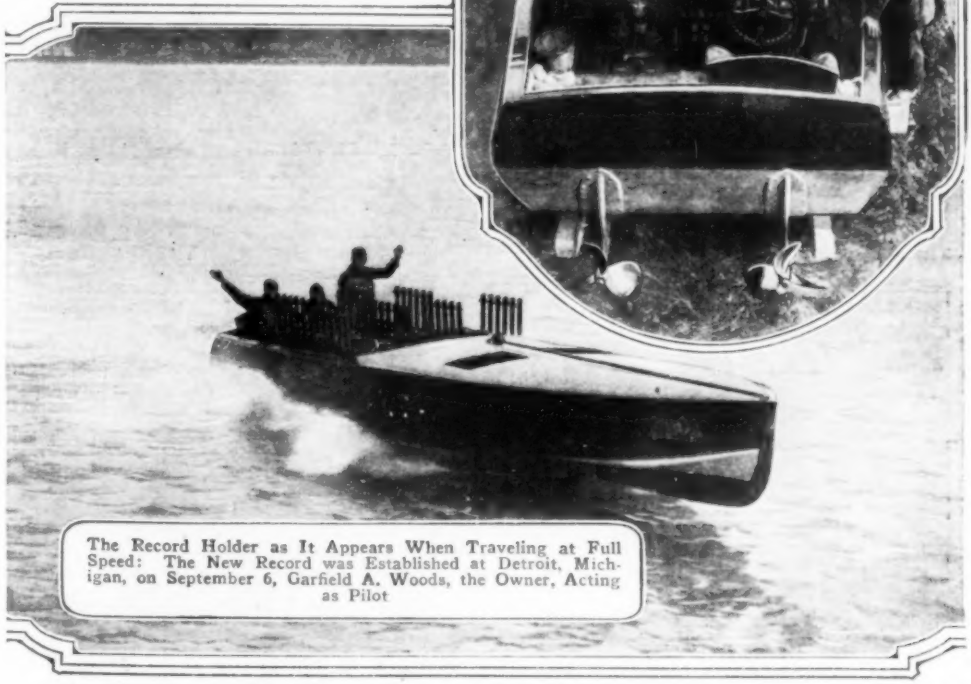


Two Views of Combination Safety Lock That can be Opened Only by Knowing the Exact Number of Seconds for Which It is Set to Operate

"MISS AMERICA II"—THE FASTEST BOAT EVER BUILT

The Speed Boat "Miss America II," Which Successfully Defended the Harmsworth Trophy for the One-Mile Speed Championship of North America, and Established a World's Record, for Water Craft, of 80.5 Miles an Hour: This Was the Average Time of Six One-Mile Trials. The Fastest Mile was Covered at 81.4 Miles an Hour. The View at the Right Shows the Two 800-Horsepower Engines Which Drive Its Two Propellers. The Only Competing Boat Was the British Racer "Maple Leaf VII," Which was Disabled, and Sank before Completing the Heat





The Record Holder as It Appears When Traveling at Full Speed: The New Record was Established at Detroit, Michigan, on September 6, Garfield A. Woods, the Owner, Acting as Pilot

MOUNTAIN SNOWS MAY SOON BE USED TO WATER DESERT

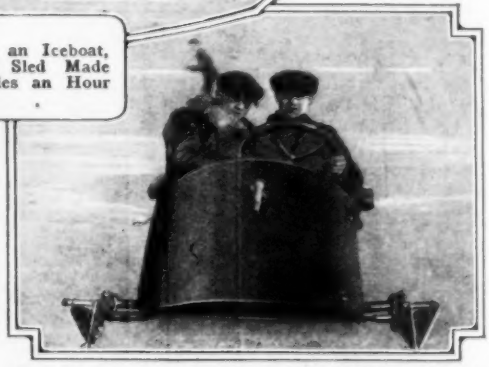
Engineers are now considering the possibility of utilizing the thousands of tons of snow on the mountainsides as irrigating water, and to accomplish this an ingenious scheme is proposed. It is thought that by beveling off sections of the mountains which impede snow slides, the snow could be made to drop into the cañons below. Such an undertaking would mean a colossal amount of work and dangerous blasting, but it is the conclusion that subsequent slides would occur without danger. After dropping into the cañons, the snow would slowly melt and feed the myriads of streams which often dry up in the warm season when water is most needed on the farms in desert places. The project is being considered for the eastern part of Oregon. Should it materialize in this section, it would be of inestimable benefit, as crop losses are immense here because of a dearth of water.

One of the Desert Farms Which will be Assured an Adequate Water Supply, If the Proposed Irrigation Project Proves Successful

POWER-DRIVEN ICEBOAT FROM MOTORCYCLE PARTS

Last winter a motorcycle, converted into an iceboat, sped frequently over the frozen surface of Lake St. Clair, near Detroit, far outrunning the ordinary sailing iceboats. The sidecar of the motorcycle became the hull of the iceboat, and in this, with an auxiliary chassis frame of simple construction, was mounted the engine together with the driving chain and sprocket of the motorcycle. To the sprocket was connected a tooth-rimmed driving wheel that was the means of propulsion. The bow of the boat was supported on a horizontal shaft, at each end of which was pivoted an ice runner, similar to those used on other iceboats. These pivoted runners were connected to rods operating with the steer-

Racing with an Iceboat, This Novel Sled Made over 80 Miles an Hour

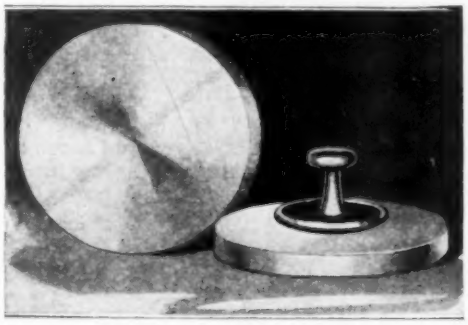


At the Left: The Power Plant, a Motorcycle Engine Geared to a Toothed Driving Wheel. At the Right: The Body Is a Motorcycle Sidecar. An Automobile Steering Gear Operates Runners in Place of Wheels

ing post and wheel of an automobile, by means of which the steering was done without difficulty.

NEW METALLIC ALLOY IS LIGHTER THAN ALUMINUM

A new metallic alloy, resembling magnesium, is now being produced and applied to mechanical uses, in Michigan. It has the same appearance as magnesium, being a silvery-white metal with considerable luster, and like this metal it is also malleable and ductile. One of its chief advantages in industry is its low specific gravity, being a third lighter than aluminum, in that respect once more resembling magnesium. The metal is obtained from a natural brine pumped from wells in the vicinity of Midland, Mich. It is extracted by electrolytic methods. Its first application in manufacturing has been in pistons for automobile engines, where, of course, its lightness is of special value. Several cars have already been

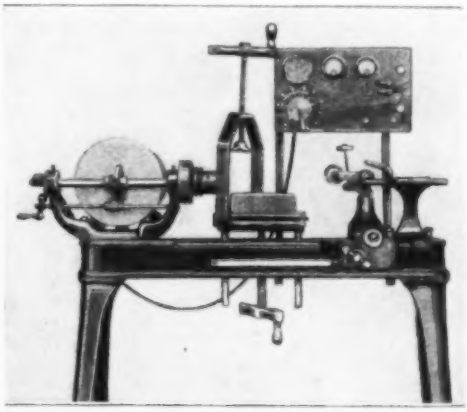


Two Small Samples of the New Metallic Alloy That Resembles Magnesium, Being Lighter Than Aluminum: Its Color and Luster can be Judged by Comparing It with the Collar Stud

equipped with pistons made of this metal, and in some cases also the crankshafts, one of the cars having traveled with the same pistons more than 35,000 miles.

TEST TABLE FOR AUTOMOTIVE AND ELECTRIC REPAIR SHOPS

A combination test table that contains a switchboard for testing electrical equipment and also a small lathe, and a mica slotter, has been designed specially for automotive and electric repair shops, and is now on the market. The electrical switchboard consists of the following instruments: a tachometer, 300 to 3,000 r.p.m.; a voltmeter to 30 volts; an ammeter to 600 amperes; a millivoltmeter to 50 millivolts, and a multiple spark gap, adjustable while the unit under test is in operation. A prony-brake drum, which also serves as a faceplate for the lathe, is permanently mounted on the spindle shaft. In connection with this is a vise.

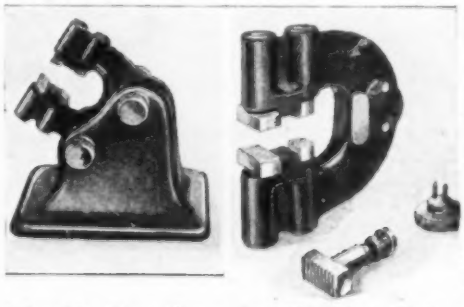


Combination Test Table with Switchboard, Equipped with Electrical Testing Instruments: It Also Has a Small Lathe, a Mica Slotter, a Prony-Brake Drum, and a Vise

furnished with a V-block for holding round parts. The vise is removable, making the mica-slotting device more accessible.

PITCH OF THREADS MEASURED BY ADJUSTABLE SNAP GAUGE

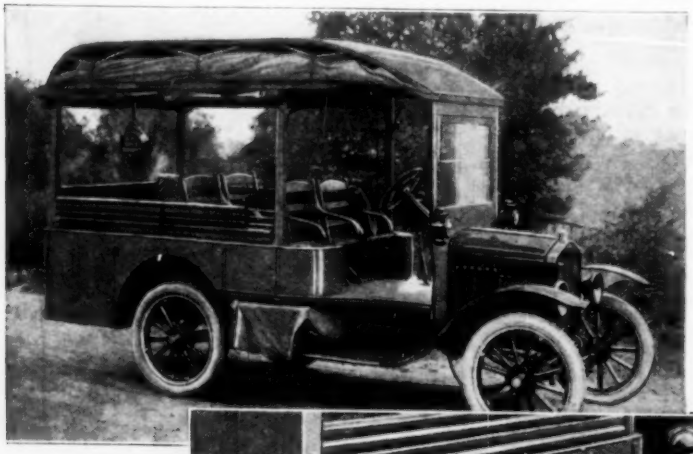
A limit snap gauge for measuring the threads of either screws or taps has been recently developed by an English manufacturer. There are two sets of anvils which detect errors in pitch. The teeth on the anvils are so shaped that if there is an error in the pitch that makes the thread too thick, it will not pass the first gauge, and if the error makes the thread too thin, it will pass the first gauge but not the second. The gap between the anvils can be adjusted to obtain an accuracy in the thread to .0001 of an inch.

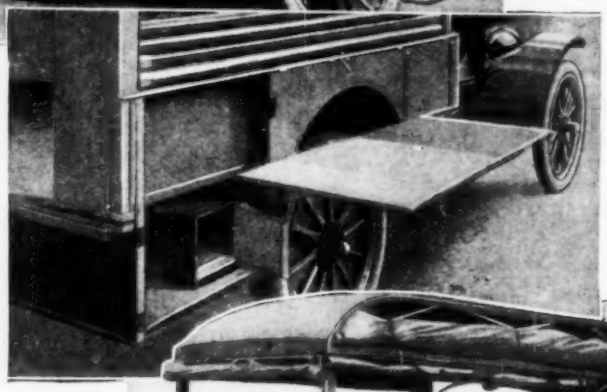


Adjustable Snap Gauge for Measuring Pitch of Threads in Taps and Screws: The Gauge at the Left Is for Bench Work, the Other for Hand Work; One Anvil is Lying beside It

COMPLETE CAMPING OUTFIT INCLUDED IN AUTO BODY

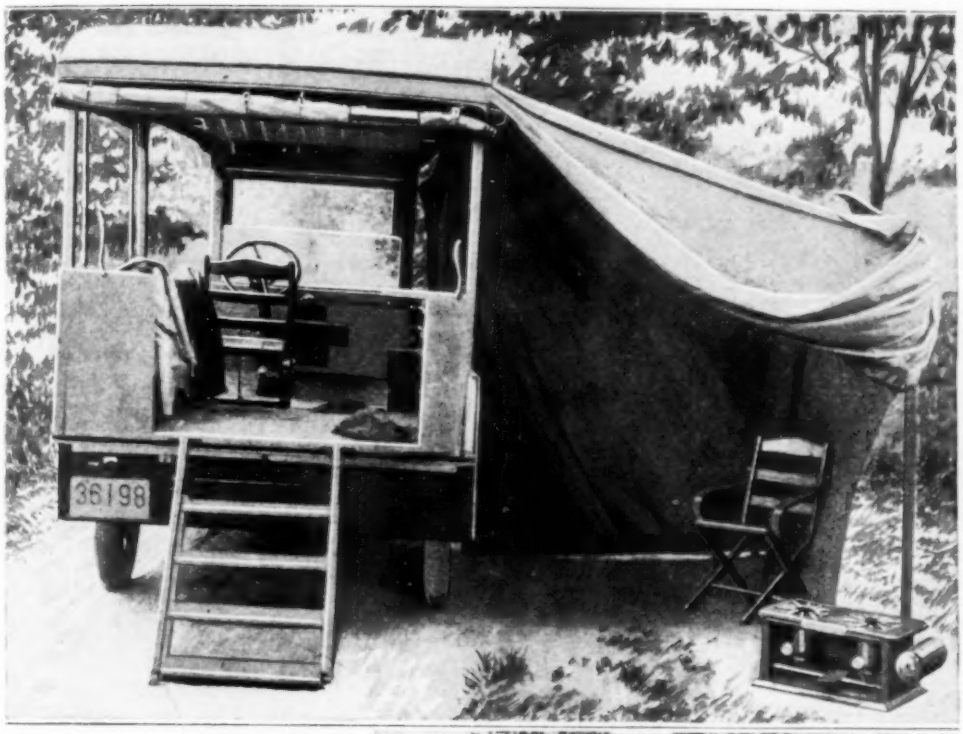
One of the latest contrivances for the motor tourist takes the form of a special camping body for the machine, and includes a number of rather novel conveniences. In general appearance it resembles the well-known "jitney bus." Sleeping accommodations are afforded by folding bunks, under which are clothing lockers. While traveling, the bunks are folded back and folding chairs take their place. A collapsible stairway at the rear serves as a tailboard when folded. Additional sleeping space is provided by a 7 by 10-ft. tent, which ordinarily is stored under the top of the body. A two-burner oilstove is carried on the running board, and the oil supply is kept in a tank under the floor of the body. There is also a compartment, for dishes and a refrigerator, under the floor, which can be reached either through a trapdoor or a side door. The latter is detachable and, when folded, forms a convenient table. On the opposite side similar doors admit to a fireless cooker and a 10-gal. water tank. When the tent is erected and the side curtains lowered, two adjoining, but entirely separate, rooms are obtained which afford every convenience for sleeping purposes and for preparing and eating meals. They are thoroughly protected against bad weather. The outfit is lighted by current from the self-starter batteries. The tent poles fit into a rack on the side of the body when not in use. Each part of the equipment is so arranged that it is out of the way when not needed, but can be gotten ready for use quickly. Where possible each part is made to serve more than one pur-





Camping Body Designed to be Used on a Light Chassis: Above, It is Shown with the Equipment Snugly Packed Out of the Way and the Folding Chairs in Place, Ready to Start the Day's Trip

In the Center, the Side Door of the "Pantry" is Shown Serving as a Table. The Refrigerator is Seen Inside. Below, the Door Is on Its Hinges, the Tent Poles Are on Their Rack, the Tent Rolled Up under the Top, and the Oilstove Is in Its Place on the Running Board



Here the Tent has been Pitched Ready to Camp. When the Curtains are Lowered Two Separate Rooms are Secured. The Small Oilstove is Carried on the Running Board

pose. The body is specially designed to be used on the chassis of a light pleasure car. It can be placed on any such chassis without special adjustment.

A DIMINUTIVE GAS PRODUCER CAST IN ONE PIECE

A diminutive gas producer, which furnishes enough gas to yield up to 75 hp., obtains its compactness by having all its parts combined in a one-piece casting. This includes the purifier and a cylindrical portion that is charged with coke, together with all the necessary ducts and ports, which replace pipes and pipe connections that would be otherwise needed. The producer operates without preheaters or warm-water tanks. It has a maximum output of 270 cu. ft. of gas per hour.

Folding Steps Serve as an Easy Entrance When Desired, or can be Folded and Used as a Tailboard. The Bunks Also Fold Out of the Way When Not in Use. Under Them Are Lockers for Clothing

BLOWER PROTECTS CITRUS ORCHARDS FROM FROST

A California orange grower has devised an inexpensive means of protecting citrus orchards from frost. The air may be 7 to

The Apparatus Which Mixes Upper and Surface Air to Protect Citrus Orchards from Frost

10° warmer 40 ft. above the ground than at the surface, and slight winds mix it sufficiently to cause a rise of 5 to 10°. This assures safety except on unusually cold nights. To mix the air, a blower was fitted to a standpipe 30 ft. high and 12 in. in diameter. The pipe may be turned in any direction. The blower is operated by an automobile engine at 2,000 r.p.m. The apparatus has raised the temperature 4° within 200 ft. to windward of the installation, and 5° throughout a five-acre orchard. The cost of operating is about $2.85 for an entire night. A means of heating the air current has also been devised, but has not yet been tested.

¶ A clock has been made entirely of hand-carved wood, by Rudolph Carpenter, of Lititz, Pa., 50,000 pieces being used.

ASPHALT SHINGLES TAPERED LIKE WOOD SHINGLES

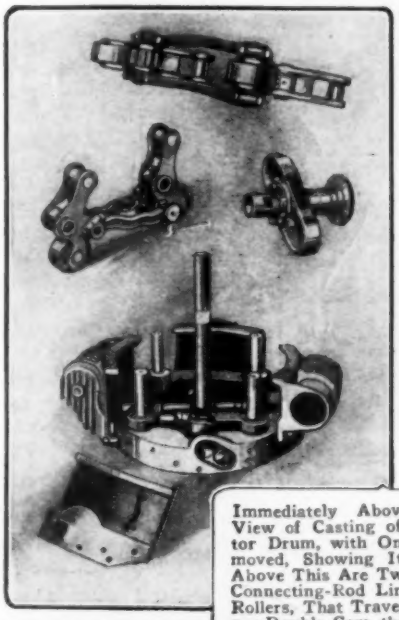
Asphalt shingles have been for some time made tapered in exactly the same manner as wood shingles. They have many advantages over the ordinary untapered asphalt shingles. Their exposed portion is almost three times as heavy as the standard 9-oz. asphalt shingle, the butt weighing 8 oz., whereas in the standard shingle it weighs only 3 oz. They can be laid over an old wood-shingled roof, and the heavy butt holds the shingle down to the roof and seals it there. Thus labor is saved and additional insulation afforded.

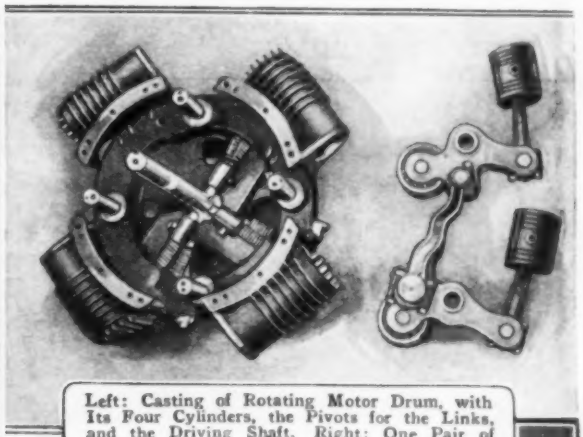
DRAGGING CHAINS PROTECT GASOLINE TRUCKS

Many people have noticed loose chains hanging from oil trucks and dragging on the ground, but few realize they are a necessity. The chain acts as a "ground" for the static electricity generated by the friction of the gasoline flowing through the pipes in the tank. Unless the electricity is grounded by a connection with the road, electric sparks are likely to ignite the gasoline as it is drawn from the faucets. If a chain is not used, some other grounding must be provided, because the truck tires act as an insulation.

The Chain Dragging on the Ground Eliminates the Static Electricity Generated by the Gasoline When It Flows through the Pipes in the Tank

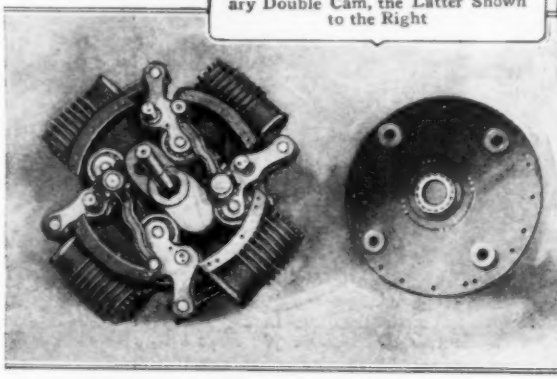
ROTARY MOTOR HAS CYLINDERS ON ITS PERIMETER

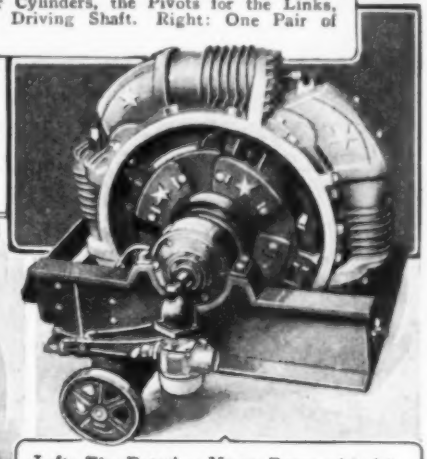




Left: Casting of Rotating Motor Drum, with Its Four Cylinders, the Pivots for the Links, and the Driving Shaft. Right: One Pair of Pistons

Immediately Above Is Another View of Casting of Rotating Motor Drum, with One Cylinder Removed, Showing Its Valve Cage. Above This Are Two Views of the Connecting-Rod Links, with Their Rollers, That Traverse the Stationary Double Cam, the Latter Shown to the Right



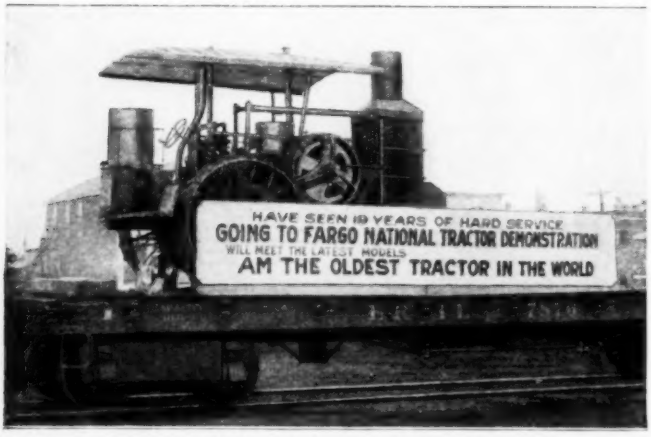


Left: The Rotating Motor Drum with All the Parts in Place, and, to the Right of It, the Circular Casting That Forms Its Covering Head. Above: The Completed Motor Shown Mounted in Its Frame, Viewed from the Intake Side, with Carburetor Attached

A type of rotary engine that has not been as often the subject of invention as many other rotary types, is that in which ordinary cylinders revolve circumferentially together with the shaft. The same principle, some time ago, was applied to a rotary air drill, but it is a very uncommon type of rotary machine. A rotary gasoline engine of this type has now been developed, in which there are four revolving cylinders and pistons, operating on the four-cycle principle. Fitted to the pistons are common connecting rods that are engaged at their crank-pin ends by links, which at their other ends carry ball-bearing rollers. These links are coupled in pairs, and their rollers traverse a double cam that is centered on the shaft, but is independent of it, and is stationary. This double cam is shaped in such a manner that the traverse of the rollers around it causes the reciprocation of the pistons, each making four strokes in one revolution and firing once, while the stationary four-cylinder four-cycle motor fires only twice in each revolution. The reaction of the firing pressures on the cylinder heads impels the device. The valves are inclosed, and hoods over the connecting-rod ends between each pair of cylinders make the machine oil-tight.

¶ The X-ray was recently employed for the detection of crime, when it was used to discover two rings which a woman had stolen and swallowed.

OLD TRACTOR ATTRACTS ATTENTION AT SHOW

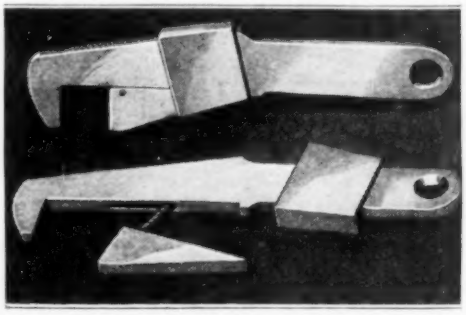

HAVE SEEN 19 YEARS OF HARD SERVICE
GOING TO FARGO NATIONAL TRACTOR DEMONSTRATION
WILL MEET THE LATEST MODELS
AM THE OLDEST TRACTOR IN THE WORLD

This Tractor Was on Exhibition during the National Tractor Show at Fargo, North Dakota. It has Been in Active Service for 19 Years and Is Still in Good Running Order. Its Owners Expect 12 More Years of Service from It

During the national tractor show held in Fargo, N. D., recently, an old tractor was the center of attraction. It had been in active service on a farm in Minnesota for 19 years, and was still in good running condition. Although it was of a popular American manufacture, its makers had forgotten its existence entirely. Upon reference to their records, they found that the tractor was one of their first gasoline machines. It is expected to give service for years to come.

CLEVERLY DEVISED WRENCH OPERATED WITH ONE HAND

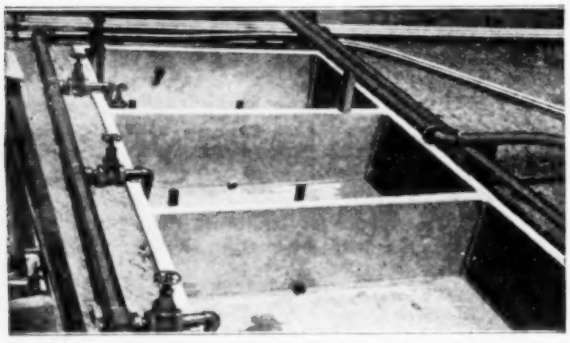
A cleverly devised wrench which has recently appeared requires the use of only one hand in its operation. It is made in sizes from 6 to 12 in. long. A triangular piece of steel serves as a lower jaw. This piece slides against the body of the wrench, to which it is attached by a small spiral spring. A sleeve fitted about it can be pushed up or down with the thumb to adjust the spread of the jaws. Milling on the back of the wrench prevents any slipping of the lower jaw when in use.



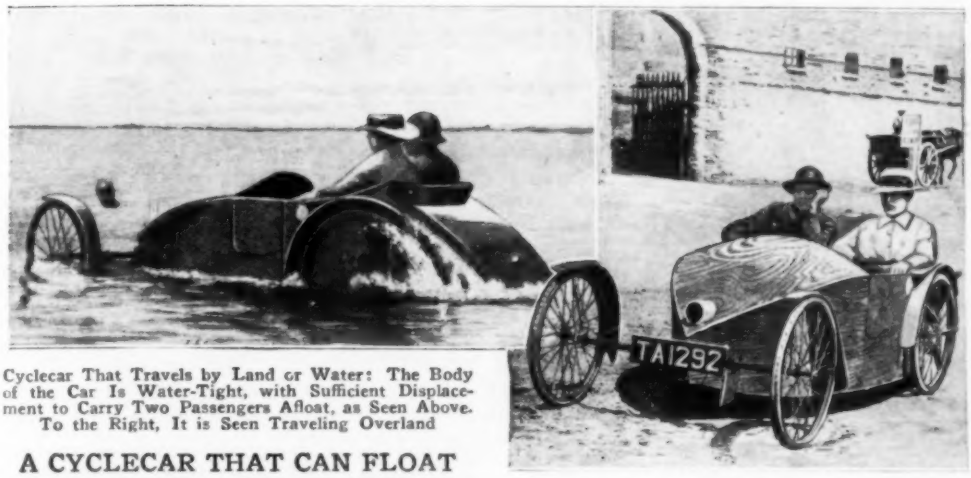
Above: The Wrench with Jaws at Full Spread. Below: The Sleeve is Slipped Down to Show How the Lower Jaw is Attached by a Spiral Spring

CONCRETE TRAPS REMOVE OIL FROM WASTE WATER

Waste water from oil-storage stations has considerable oil mixed with it. Around San Francisco Bay, this mixture has been found fatal to fish, and so the discharge of oily water into the bay has been prohibited. The stations have, therefore, taken precautions to separate the oil from the water before it is drained away. The installation consists of a series of concrete traps into which the oily water flows successively. In the first tank, a quantity of the oil will rise to the top and be skimmed off by a suction line. The same action occurs in the next two traps, after which the water is considered sufficiently pure to be drained into the bay without causing any damage.



Concrete Drain, by Which Oil is Skimmed Off Waste Water from Oil-Storage Stations, Before It is Allowed to Drain into San Francisco Bay



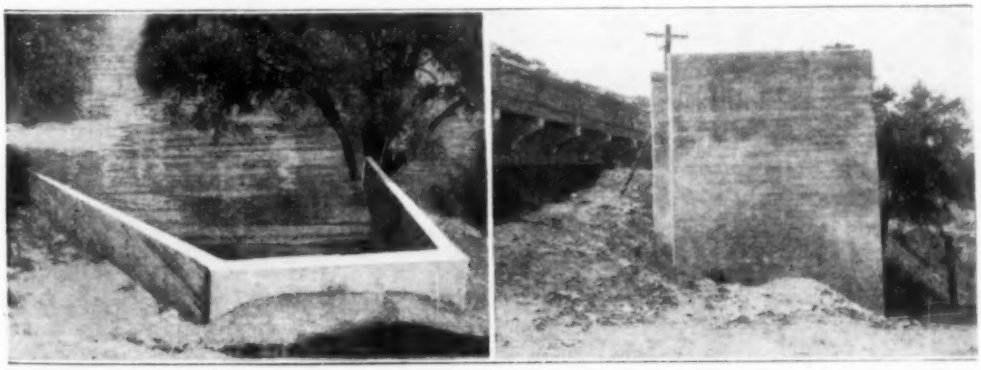
Cyclecar That Travels by Land or Water: The Body of the Car Is Water-Tight, with Sufficient Displacement to Carry Two Passengers Afloat, as Seen Above. To the Right, It is Seen Traveling Overland

A CYCLECAR THAT CAN FLOAT TRAVELS BY LAND OR WATER

Diminutive automobiles, known as cyclecars, have always been much more popular in England than in this country, and such a car has now been introduced there that travels by water as well as by land. Its body is in the nature of a water-tight hull which is propelled in the usual manner overland, and has paddle blades on its rear wheels to drive it when it is afloat in the water. It is equipped with a 2½-hp. two-cycle engine which will propel it on level land at a speed of 30 miles an hour.

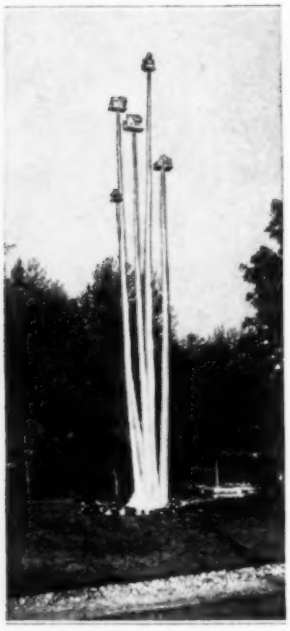
TEMPORARY WOODEN GATES TILL STEEL IS CHEAPER

In the construction of the new Devil's Gate Dam, near Pasadena, Calif., the high cost of building is going to be circumvented, to some extent at least, by the simple expedient of exercising a little patience. The dam is entirely completed with the exception of the floodgates. These must eventually be made of steel, but as the price of that commodity is now so high, it was decided to construct a temporary set of wooden gates, which will serve the purpose of storing the water, so badly needed for irrigation, until the steel can be purchased more economically. To take care of extremely high water, which might result from exceptionally heavy rainfall, the gates are so constructed that they can be readily removed. The temporary gates will cost about $3,500, and it is estimated that considerably more than this will be saved by waiting for a reduction in the price of steel before installing the permanent gates, which will cost, even then, about $40,000. Access to the wooden gates, should their removal be necessitated, is provided by means of a vertical passageway from the top of the dam.



Left: Entrance to Outlet Tunnel, Showing the Water Held in Storage for Irrigation by the Temporary Wooden Gates. Right: Top of the Vertical Passageway Which Affords Access to the Wooden Gates, should a Flood Necessitate Their Sudden Removal. These Temporary Gates are to be Replaced Later by Steel Gates

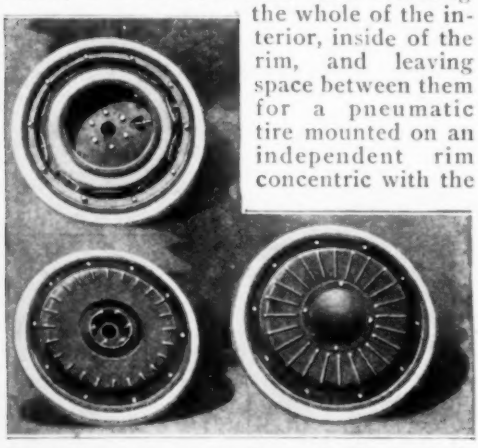
UNUSUAL MOUNTING FOR BIRD HOUSES MADE FROM POPLARS



An unusual mounting, made from a clump of poplar trees, supports five bird houses on the grounds of the State Fish Hatchery, at Paris, Mich. The poplars were felled, the branches and bark removed, and the trunks painted. They were then raised and bolted in place. Cement about the bottom forms a solid foundation, while steel stringers near the base and about halfway up serve as braces.

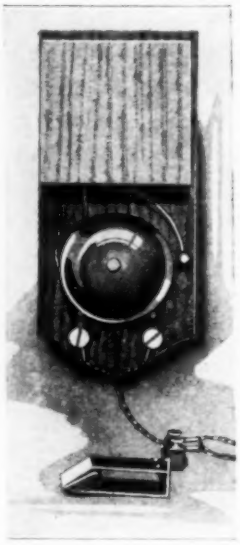
PNEUMATIC TIRE INSIDE RIM INSTEAD OF OUTSIDE OF IT

A newly patented resilient motor-car wheel has some characteristics of a disk wheel, a front and back disk inclosing the whole of the interior, inside of the rim, and leaving space between them for a pneumatic tire mounted on an independent rim concentric with the outside rim of the wheel. There is sufficient clearance between this pneumatic tire and the wheel rim for 10 metal shoes, which are spaced around its peripheral face and connected to what corresponds to the wheel hub. Thus the inside pneumatic tire takes all the shocks and acts in the same manner as an ordinary outside pneumatic tire, with the difference that it is at all times entirely inclosed, making punctures, or other damage from the road, impossible. On the outside rim of the wheel, preferably there would be a solid rubber tire, but even without this the wheel would be resilient.



Motor-Car Wheel with Its Pneumatic Tire inside the Wheel Rim Instead of Outside of It: It is Inclosed between the Two Wheel Disks. The Outside Tire Is Solid

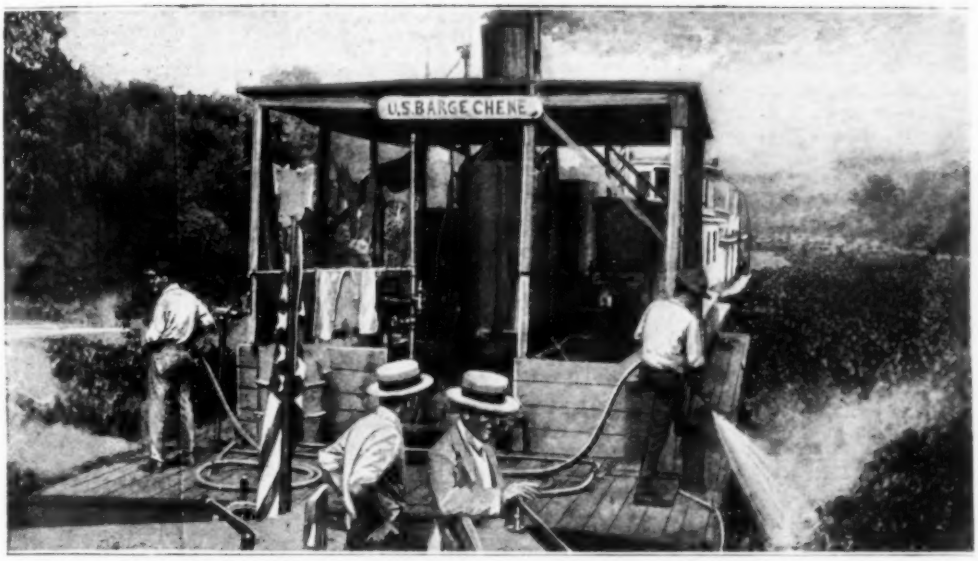
ELECTRIC ALARM RINGS WHEN DOOR IS OPENED



A very simple electric alarm that tells when the door to which it is applied swings open, is a new French invention. A wedge-shaped switch of spring metal, connected to an electric bell and its battery, is placed before the door on the floor. As the door swings open, the inclined surface of the switch is depressed, establishing an electric circuit to the bell, which rings. Two sharp lugs at the bottom of the switch are imbedded in the floor to keep it from sliding away.

LIGNITE UTILIZED AS FUEL BY GASIFICATION METHOD

Lignite in its powdered form has long been used as fuel, but it has had many disadvantages, up to the present, consisting chiefly in the difficulty of drying it, and of saving its by-products. It has now been found possible to combine the drying with a partial gasification which admits the recovery of the by-products while yielding a semicoke which can be ground down to make a powdered fuel suitable for injection into combustion chambers. The temperature recommended for this gasification is between 900° and 1,000° F. Experiments with this fuel in rotary cement kilns have proved satisfactory.



Spraying Water Hyacinths with Live Steam: This was Recently Found to Be the Most Effective Method of Combating This Plant Which Clogs Waterways and Seriously Interferes with Traffic

LIVE STEAM USED TO FIGHT WATER HYACINTH

THROUGHOUT Louisiana, Alabama, and Florida, the water hyacinth is a serious menace to navigation. Recently live steam was used with success in combating the plant, and plans are being made to adopt this method on a large scale. If the system is as successful as the experiments, it will effect a saving of millions of dollars. Arsenic sprays have been used to fight the pest, but with only partial success. The poisoned plants have caused the death of large numbers of cattle which fed upon them, as well as temporary pollution of the water.

The Beautiful Purple-Flowered Water Hyacinth Which has Become a Pest in the South

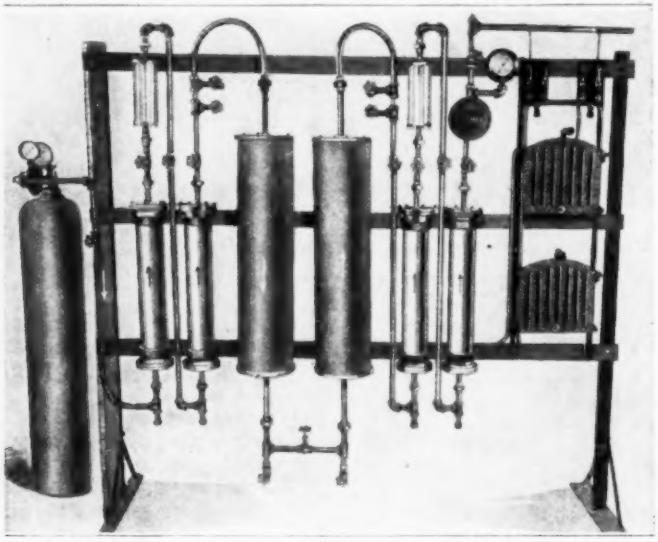
In July, several boats were caught in a hyacinth jam in Bayou Lafourche, and the U. S. "Hyacinth"—a powerful stern wheeler—was sent to the rescue, towing a barge equipped with arsenic sprays. The plant growth was so solid that the "Hyacinth" broke several steel cables trying to force its way through with the

The Atchafalaya River Waterfront at Morgan City, Louisiana: The "Lilies," as They are Called Locally, have Formed a Solid Mass of Growth in the Water, Which Is Impassable by Boats

tow. At the suggestion of Governor Parker, of Louisiana, hand nozzles were improvised and live steam shot onto the plants. The effect was almost magical, and the "Hyacinth" was able to advance at the rate of a mile and a half an hour. It is now planned to equip boats with nozzles to shoot live steam onto the hyacinth bulbs as well as the leaves, and kill the entire plant. This method will be cheaper than the arsenic spray, as well as more rapid and effective.

PURIFICATION OF GASES FOR ELECTRIC BULBS

The necessity of purifying the nitrogen and argon gases used in filling electric-light bulbs so as to preserve the filaments, has resulted in the invention of a machine which operates under a pressure of 30 to 50 lb., and will fill from 18 to 20 thousand 100-watt lamps per day. The gas is purified in two electric furnaces; one containing copper in a steel tube and the other copper oxide. As the purified gas leaves the machine for the supply line, the pressure is reduced by the action of a heat-regulated diaphragm valve to 5 lb., which is the usual pressure used in the bulbs. It is claimed for the method that a purer gas is developed in less time than with earlier apparatus. Metal connections are used throughout, which eliminates trouble common to the old type of apparatus.



The Gas from the Tank at the Left Passes through the Two Nearest Cylinders, the Furnaces in the Middle, and the Cylinders on Their Right, being Thus Freed of Water, Carbonic Oxide, Oxygen, and Other Impurities. Before Entering the Supply Line a Heat-Regulated Valve Reduces Its Pressure to Five Pounds

HOMES OF ONE TOWN HAULED TO ANOTHER DURING BOOM

In the gold-mining sections of the West, the rise and fall of a town is the matter of a short time. Goldfield, Nev., once fostered a population of 10,000 people, but with the dearth of gold in the neighboring mines, lost all but a bare thousand. Thirty-five miles across the desert lies Tonopah, Nev., where a more recent strike called forth a great increase in population. In about four weeks, Tonopah was inhabited by 15,000 people instead of her original 3,000, and a housing shortage of serious proportions developed. Finally the remedy came in the form of the abandoned houses of Goldfield, which were loaded on wagons and hauled across the desert to Tonopah.

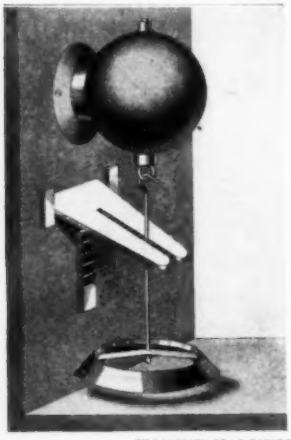
Hauling a House from Goldfield to Tonopah, Nevada, across 35 Miles of Desert: This Was a Common Sight during the Recent "Boom," When the Population of Tonopah Jumped from 3,000 to 15,000 in Four Weeks

MEXICO'S "SMOKING MOUNTAIN" FROM AN AIRPLANE

THESE photographs are the first ever taken, from an airplane, of the summit of Popocatepetl, the "Smoking Mountain" of Mexico. This volcano lies about 20 miles southeast of Mexico City. It was very active about the time of the Spanish conquest, but no eruption has been recorded since 1540, though it still smokes. It rises in the form of a cone to a height of 17,876 ft., and its top is continually covered with snow.

DEVICE SECURES EQUILIBRIUM AT HIGH ROTATING SPEEDS

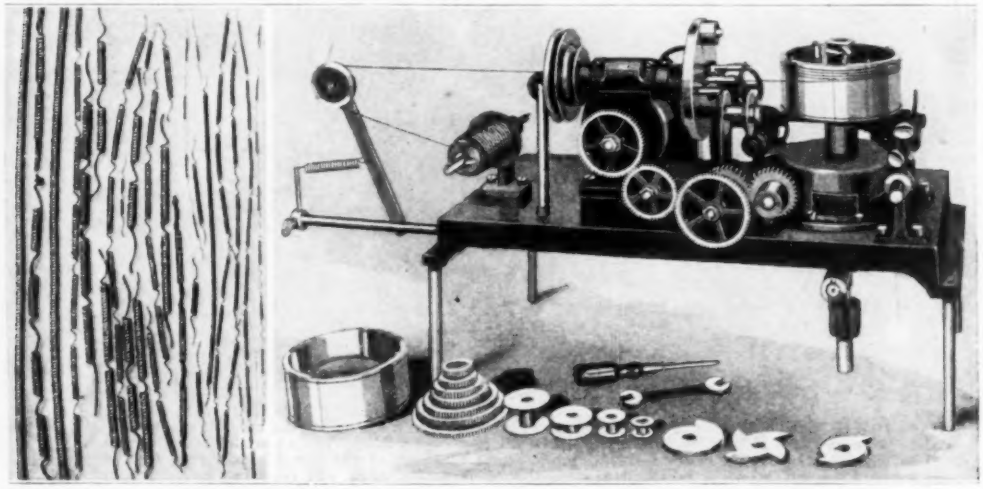
It is difficult to maintain the equilibrium of centrifugal devices that rotate at extremely high speeds. This difficulty has been overcome by means of an ingenious balancer of French origin. An embodiment of the principle involved is shown in a small high-speed motor with its rotating spindle vertical, and having on its end a loop from which is suspended by a hook a metal wire about 12 in. long which carries at its lower end a centrifugating circular frame, or collar. In revolving, the suspended wire will describe a cone around a line that is the prolongation of the vertical axis of the motor. When desired, this eccentric movement of the lower balancing circular frame can be prevented by means of a slotted adjustable guide hinged to the part of the apparatus that supports the motor. This is slotted in such a manner that it prevents the conical movement of the wire until, by lowering the guide, the wire reaches the rounded end points on either side of the slot. The apparatus can be applied to centrifugal laboratory devices similar in principle to the cream separator.



BY COURTESY OF LA NATURE

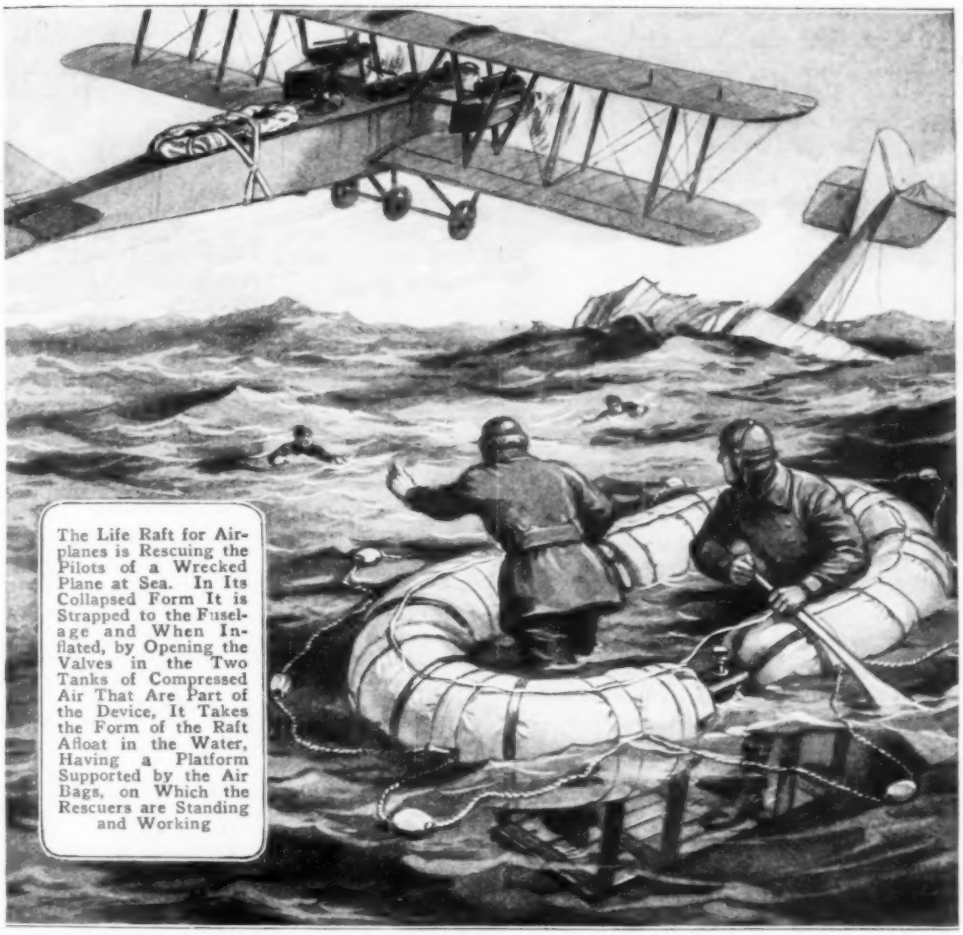
INTRICATE MACHINE WINDS ELECTRIC-LAMP FILAMENTS

The fine spirals forming the filaments of incandescent bulbs are made by wrapping the special alloy wire of which they are composed on a base wire of iron, steel, or brass at the rate of 3,000 turns per minute by means of an ingenious machine, especially designed for the purpose by an eastern inventor. After wrapping, the center or base wire, also called the mandrel or core, is dissolved with acid, leaving the familiar, evenly spaced coils. In its essential parts, the machine consists of a hollow shaft, fitted with a pulley at the outer end and a steel disk at the inner, and a drum upon which the base wire is wound up after the wrapping operation is completed. The disk carries a spool upon which the filament wire is wound and from which it feeds evenly. As the base wire is slowly drawn through the hollow shaft and is wound up on the final drum, the disk and spool revolve around it and wrap it with the continuous, evenly spaced spiral of the filament wire. In some cases it is necessary to heat the delicate strand to redness in order to procure a smooth wrapping. This is done by passing an electric current through it during the winding operation. In the smallest lamps the wire is only .001 in. thick and the hole through the spiral only .003 in. in diameter.



Machine for Winding Coils Used in Electric-Lamp Filaments: Completed Coils are Wound on the Drum to the Right. A Number of Different Sizes and Types of Coils Made are Shown to the Left

LIFE RAFT IS AID TO AIRPLANE AND ITS PILOTS



The Life Raft for Airplanes is Rescuing the Pilots of a Wrecked Plane at Sea. In Its Collapsed Form It is Strapped to the Fuselage and When Inflated, by Opening the Valves in the Two Tanks of Compressed Air That Are Part of the Device, It Takes the Form of the Raft Afloat in the Water, Having a Platform Supported by the Air Bags, on Which the Rescuers are Standing and Working

For airplanes that operate over the ocean, or other large bodies of water, a life raft has been constructed that can be used to rescue drowning men, or to keep the plane itself afloat if it falls into the water. Carried detachably on top of the fuselage of the airplane, the raft is a pneumatic affair composed of two cylindrical tanks, of much greater length than diameter, which are filled with compressed air. They are disposed opposite each other in a long collapsible air bag, also cylindrical, which joins the two tanks together in a continuous oblong form. Centrally on the face of each of the tanks is a valve connected to a short pipe which leads to the air bag. This forms an air passage by means of which, when the valve is opened, the compressed air passes into the air bags and fills them, the pressure distending them so that they form a continuous rigid oval tube. Inside this, and suspended from it flexibly, is a folding wooden platform, which opens out when the air pressure distends the bags. Connected to the bags are life lines with small floats that can be seized by the persons afloat beside the raft. The platform is for supporting the rescuers and the rescued. This life raft is an English invention, and, after satisfactory trials, has been adopted by the British Royal Air Force.

¶ In the hands of experienced fire fighters, it has been found the emergency fan, after a proper arrangement of canvas stoppings has been made, can be used to surround a mine fire with a blanket of gases low in oxygen and high in carbon dioxide, which have been generated by the fire itself.

BANK TELLER FIRES HIDDEN GUN WITH HANDS EXTENDED

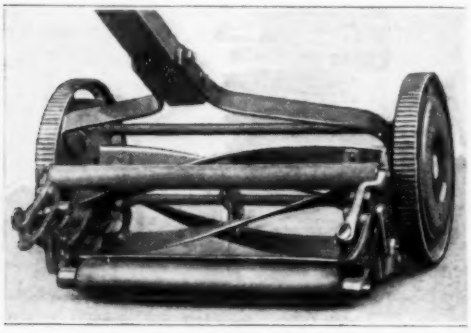
A new protective device by which a bank teller may administer sharp reprisal to a holdup man before his window, has

The Gun Strapped to the Teller's Side may be Fired by Operating a Bulb Held in the Hand

recently been produced. It consists of a revolver, harnessed to the body under the coat and vest, which is fired by a compressed-air device operated by a bulb held in the right hand. As the thief requires the teller to raise his hands, the teller complies, and operates the firing means. With each compression of the bulb, the revolver fires a bullet toward the holdup man.

ATTACHMENT FOR LAWN MOWER MAKES IT SELF-SHARPENING

Any lawn mower can now be made self-sharpening by an attachment in the form of a roller grinder that is made in various sizes to fit all machines. It is detachable, but it can be left on the mower permanently, as it is provided with setscrews by means of which it can be thrown in or out of operation. This adjustability makes it possible to grind the mower blades in any manner desired.



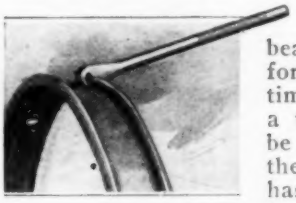
Sharpening Attachment for Lawn Mower: The Grinder is Easily Thrown Out of Operation

NOVEL FRENCH CRAFT THAT IS AS MUCH A SHOP AS A SHIP

A "ship-shop" is a new means of merchandising that is being carried out by the coöperation of a number of merchants with the French government. As its name implies, it is actually a ship, but it is also as much a shop as a ship, for all its decks are lined with complete shops which are miniature reproductions of some of the most famous stores in Paris. Indeed, the ship might be aptly called an epitome of Paris. Every kind of store is represented, and shoppers can buy anything from a furbelow to a diamond. The ship is owned by the French government, but the shops are all rented to private concerns. The first voyage was started recently from Nantes, and is to be from port to port in the Baltic, calling at Liban, Riga, Danzig, Reval, and Helsingfors.

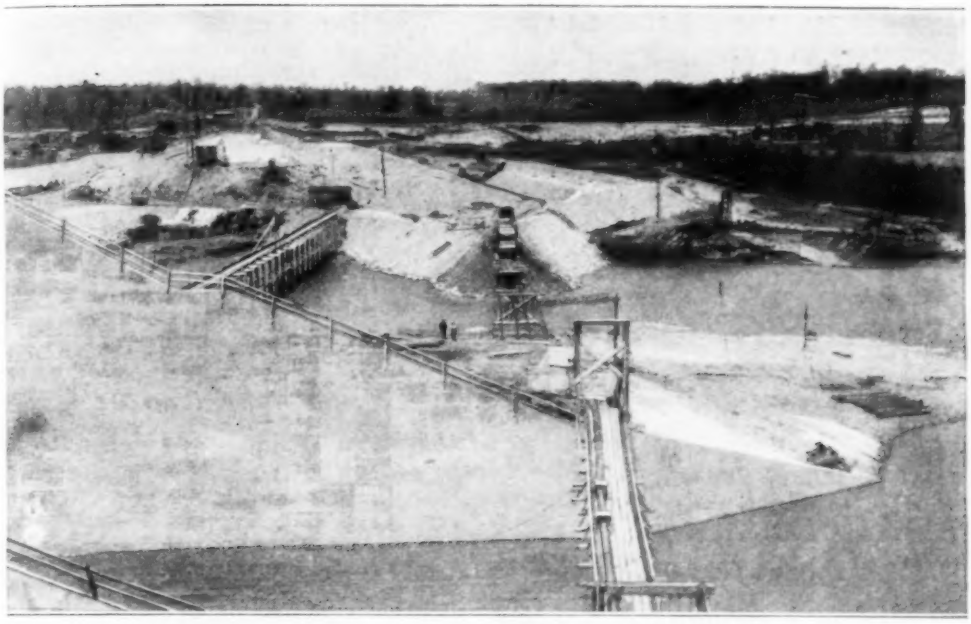
BEAD FORMER FOR RIMS EFFECTS ECONOMY

Running on the rim is often unavoidable in an emergency. Such traveling, however, badly flattens the rim bead if carried on for any length of time. Now comes a tool which can be used to re-form the bead after it has been flattened by rim-running. The tool is in the form of a lever, knurled at one end and provided with a specially shaped jaw at the other. The jaw is placed over the defective bead, as shown, and by applying pressure on the lever, the bead is rolled to the proper shape.



EMBANKMENT ACROSS CHANNEL MADE IN NOVEL MANNER

In connection with the $25,000,000 flood-prevention project in the Miami Valley, Ohio, it became necessary to close an old river channel by a dam at Taylorville, and a novel means of doing this was adopted. It was decided to span the chan-



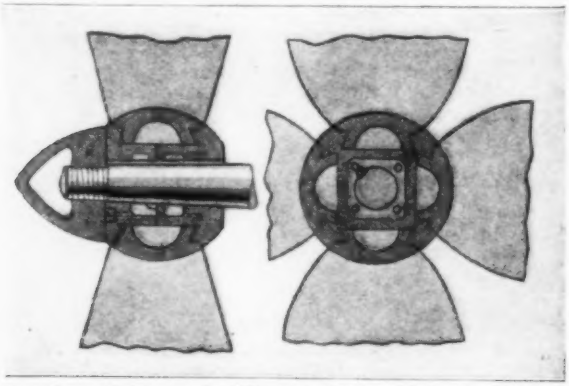
General View of the Work in Connection with the Taylorville Dam in the Miami Valley, Ohio: The Enterprise Is Part of the Large Engineering Project to Prevent and Control Floods, and Includes the Construction of a Large Dry Reservoir

nel from bank to bank with a rock embankment, or dam. The first operation was to construct a light trestle across the channel which was to form a retaining frame for the rock fill, but which in itself would not be strong enough to carry the load of the cars. Therefore, above this were stretched, as tightly as possible, and securely anchored in the bank on either side, four heavy cables properly spaced for supporting a series of railroad ties laid across them. On these the rails were spiked. In making the fill, the train of loaded cars was backed onto the cable-supported rails, and the rear car was dumped, and so on successively, so that there was never more than one loaded car at a time on the unsupported part of the cables. Neither the loaded cars nor the locomotive came onto it until the embankment had been filled to the rail level.

Making an Embankment across an Open Channel: Above the Light Trestle are Stretched Four Heavy Cables That Carry Railroad Ties, and the Rails onto Which the Cars are Backed and Then Dumped, So That There Is Never More Than One Loaded Car at a Time Unsupported by the Growing Embankment

PROPELLER WITH EACH BLADE SEPARATELY ADJUSTABLE

An adjustable propeller in which the same boss at its hub will take various-sized and shaped blades, all equally adjustable, is distinctly a novelty. This boss is of spherical shape, divided in halves transversely, and fitting the tapered end of the propeller shaft upon which it is secured by means of an end nut screwed upon the threaded end of the shaft. The boss is also keyed to the shaft. In this spherical boss are circular conical recesses into which fit similarly coned portions at the root of the blades. These are inserted by separating the two halves of the boss, and are securely held in position when these halves are clamped together by the screwing up of the end nut. They are retained relatively in correct position by means of dowels. Before tightening the end nut the blades can be turned about their coned roots, setting the faces at any desired pitch. Any blade with the same shape root can be connected to the boss.

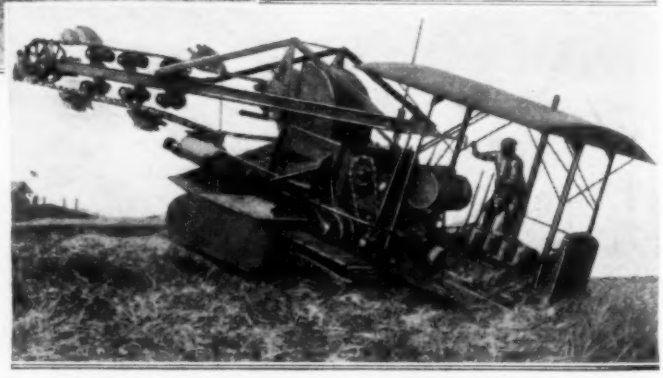


Propeller with Separately Adjustable Blades: Left, Longitudinal Section; Right, Transverse Section

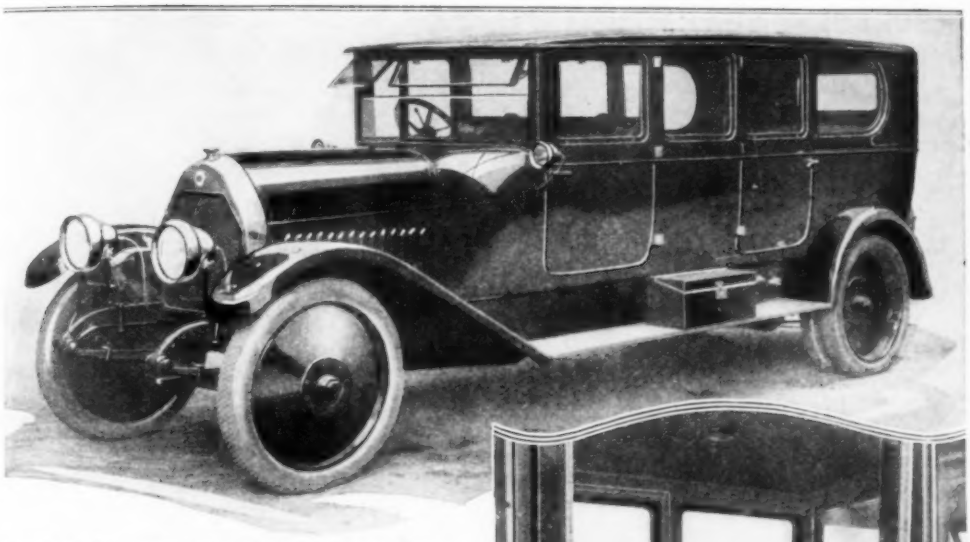
ENDLESS-TREAD EXCAVATOR TURNS IN OWN LENGTH

The latest in trench-digging machines will do all the stunts that a military tank will do, and besides can do a neat job of excavating. Working between buildings, over sidewalks and curbs, crawling through swamps, climbing over banks, and turning quickly in its own length, the machine will get to its location despite all obstacles. Heavy friction clutches, one on each side, control the steering and permit the execution of the quick turning movement. The work of the standard trencher—from 2 to 20 lineal feet per minute, varying with soil conditions—can be done with this digger, and in places where the more cumbersome machine could not operate successfully. The over-all dimensions of the machine are: length, including boom, 29 ft.; height, 14 ft., and width, 10 ft. 3 in., and its total shipping weight is about 11 tons.

Trenching Machine with Endless-Tread Traction Resembling That Used on Military Tanks



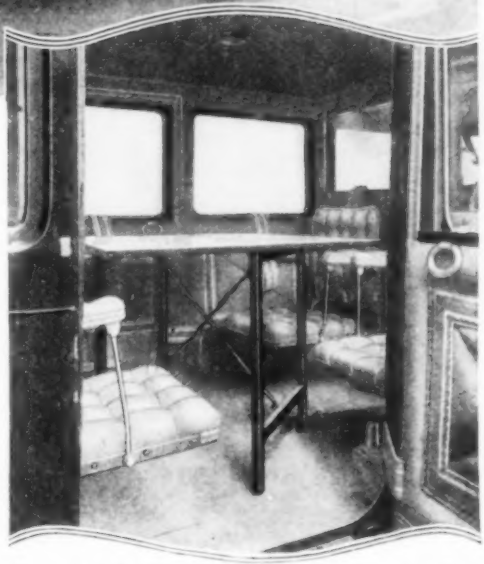
Trenching Machine Traveling over Rough Ground in War-Tank Fashion: The Digging Buckets are Seen on the Boom at the Rear



Luxurious Limousine Body Built on a Truck Chassis: The English Owner has Secured for Himself Both a Capacious Body and a Stable Vehicle

LIMOUSINE BUILT ON TRUCK CHASSIS IS WONDER CAR

A motor-truck chassis of Italian manufacture and an English special limousine body have been combined recently into one of the most luxurious and roadworthy of pleasure cars. The unusual combination has resulted in a conveyance which has great stability and a much increased amount of available space. Besides a rear seat accommodating three passengers, there is room in the rear section for four large armchairs. In addition, a folding card table is included in the equipment. When not in use, the table is folded and placed in a special floor compartment, out of the way. The driver's compartment is separated from the cab part and will seat three persons.



Even with Three People in the Rear Seat and Four Armchairs in Use, There Is Ample Room for a Card Table Which Folds into a Special Compartment When Not in Use

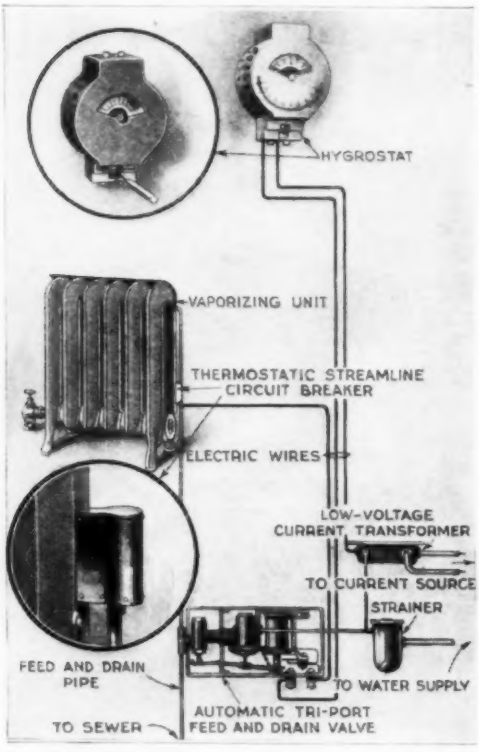
FIND ANIMAL SURVIVOR OF PREHISTORIC PERIOD

A report has been published by the Field Museum of Natural History, at Chicago, describing an animal discovered in South America, which is a survivor of a prehistoric period. This animal, known as Cænolestes, is small and looks like a sharp-nosed rat, but is different from any other living animal. Its bones and teeth are essentially the same as those of a group of animals now extinct and known only through fossils hundreds of thousands of years old. It has a pouch like the kangaroo, and its existence may indicate some truth in the theory that South America and Australia were connected by land in prehistoric times, since pouched animals exist in both places. The original stock may have spread from South America to Australia, or vice versa, or it may have originated in a long-vanished continent, the so-called Antarctica, and spread north to both continents, over a land bridge, which is supposed to have linked the three.

¶An apparatus for detecting rapid changes in the voltage of atmospheric electricity is proposed for the purpose of warning power-station operators of the approach of thunderstorms, which may cause dangerous load conditions.

INSTRUMENT THAT MAINTAINS UNIFORM HUMIDITY OF AIR

Many means have been tried to counteract the most objectionable feature of steam heating, namely, that it is apt to



Instrument That Maintains Uniform Atmospheric Humidity: Notations Show How the Hygrostat, by an Electrical Device, Operates a Vaporizing Unit Attached to the Radiator

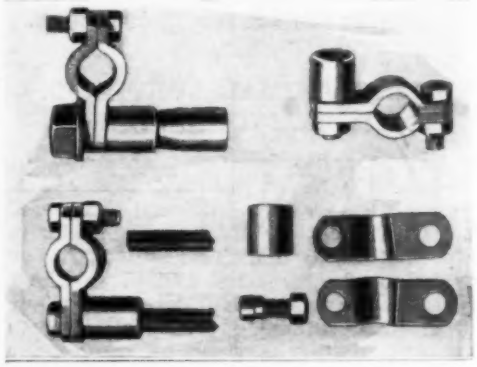
reduce the humidity of the air to a degree that is bad for the health. To be healthfully habitable, the air of a living room should have a relative humidity of about 60. There is a new device now on the market that maintains this degree of humidity automatically. Steam-heated rooms have long had their heat maintained at a uniform temperature by the use of a thermostat, and as this new instrument, in a similar manner, maintains a uniform humidity, it may aptly be called a hygrostat. It operates in connection with a vaporizing unit which is attached to a radiator, and which, by the action of the hygrostat, when the air becomes too dry, is caused to drip water upon the radiator, the heat of which vaporizes this water, and renews the moisture in the air till its humidity is again raised to any degree for which the hygrostat is set.

NEW ALLOY—STAINLESS IRON—ADAPTED TO MANY USES

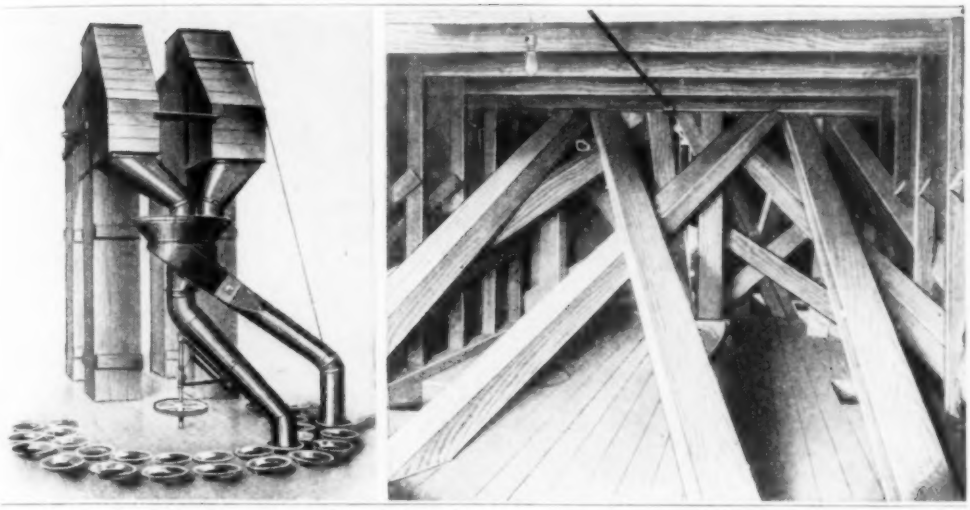
A new alloy known as stainless iron, which is softer and more easily worked than stainless steel, offers wide possibilities of use. Though it is more expensive to produce than brass or stainless steel, because 10 to 12 per cent of costly carbon-free ferrochrome is used in its composition, its advantages are expected to outweigh the extra cost. It is now being used for golf clubs, cooking utensils, motor fittings, and house-finishing hardware. It is expected to replace aluminum in motor-car bodies, as it is less expensive and more durable. A recently patented process for producing carbon-free ferrochrome more cheaply may materially reduce the cost of this new alloy.

CLAMP-TYPE CONNECTING LUG FITS ALL AUTO BATTERIES

A simple device, lately offered to automobile storage-battery service stations, is designed to eliminate the necessity of burning (welding) lead receptacle lugs, for the tapered starter-cable thimbles, to the terminal posts of service batteries. It consists of two pieces of heavy-gauge flat brass stock, each shaped with a transverse taper indentation, slightly off center, which fits half the post, and drilled with ¼-in. holes through both ends. To use, it is placed on the post, at any angle desired, and drawn up snugly with a bolt through the shorter end. The lead-headed terminal screw is then put through the remaining hole and a brass bushing, and drawn up tight in the taper thimble on the end of each starter cable. This latter action finishes clamping the device to the battery post.



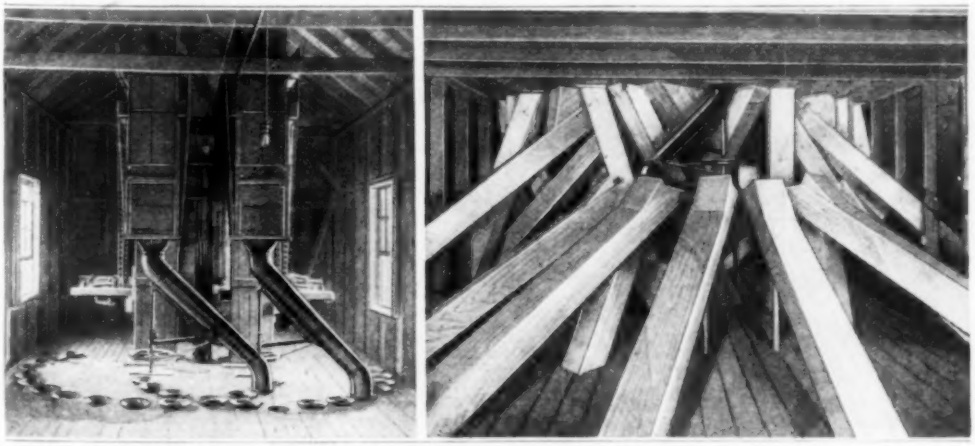
Top View: Auto-Battery Clamp-Type Lug as Used with Cable Terminals; the Cable is Soldered into the Bushing. Below: How the Device is Used with Standard Thimble-Type Terminals



The Simplified System of Distributors for Grain Elevators. At the Left: The Funnels Are in Two Rows and Lead to the Same Take-Off Spouts. They Are Independently Accessible from Either Distributor. At the Right: Only Half as Many Spouts are Required for the Same Number of Bins as with the Old System

NEW DEVICE SIMPLIFIES ELEVATOR PRACTICE

A distributing device which greatly simplifies the handling of grain, has recently been devised for use in elevators. It consists of the usual double-leg grain-hoisting rig with improved distributing spouts and funnels. The grain pours into a hopper at the top of the distributing spouts, where it is directed to either or both of them. After passing through the spouts, it is forwarded into funnels laid out in semicircular rows on the floor and thence down through chutes to the different bins. Heretofore, two chutes to each bin were necessary, as the spout of one leg could not reach the funnels under the other. When, for instance, wheat was being poured to its bin, it would pour through a chute under each spout. By parallel travel of the two spouts, as in the new device, over the rows of funnels which converge under the floor, both elevator legs deliver their load to the same bin through one chute. The spouts may also be adjusted to work entirely independent of each other, delivering different kinds of grain to different bins at the same time. This distribution system materially reduces the cost of elevator construction because of the few spouts required.

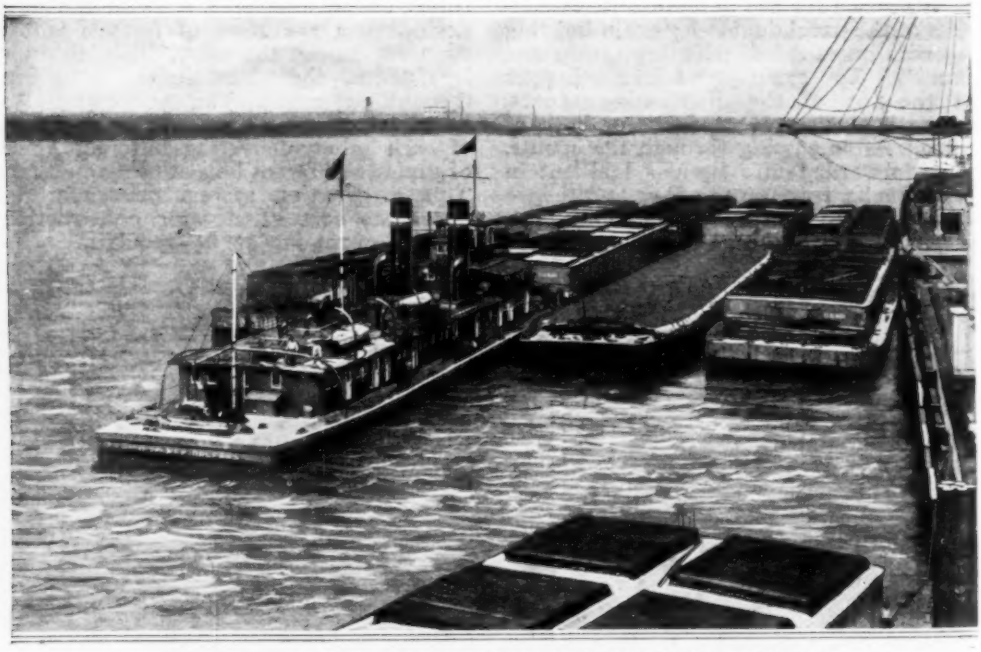


The Old System is Shown Here. At the Left Funnels Lead to a Complete Set of Spouts Built for Each Leg. Some Bins could Not be Reached by Both Distributors Because of Insufficient Pitch. At the Right: The Large Number of Spouts Required for This Type of Installation is Seen Here

TURNTABLE MAKES PHONOGRAPH PLAY FOUR RECORDS

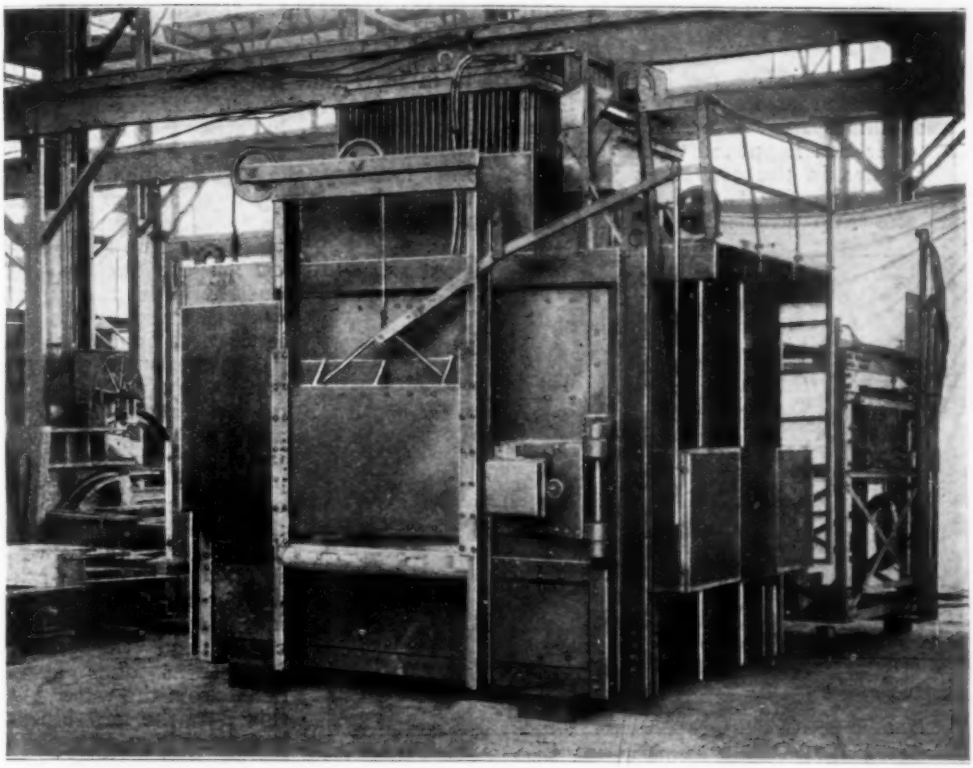
The Larger Disk, Supporting the Four Record Tables, Moves the Latter Slowly While the Record is Playing. When the Piece is Finished, It Rotates Quickly and Sets Another Record for Playing

A late model multiple-record phonograph which utilizes the motion of a turntable to effect record changes is now on the market. Four revolving record tables carry the records and pass in consecutive order under the tone arm for playing. Instead of the tone arm being guided across the records by the record grooves, a large revolving table, supporting the four spinning disks, slowly moves the groove under the tone arm. During the playing, the larger table moves very slowly. When the piece has been finished, the tone arm automatically rises, and the larger table, after a short stop, suddenly makes a partial revolution by which the next record is brought into place. While one record is being played any of the other three can be changed. An electric motor eliminates winding.



TOWBOAT MAKES RECORD HAULING MISSISSIPPI FREIGHT

THE Mississippi towboat "Cairo" docked at New Orleans, La., on August 27, after completing a record-breaking trip. A cargo of 12,000 tons, sufficient to load two good-sized steamships, was towed on eight barges, the largest single tow in the history of the barge line. The trip, from Cairo, Ill., to New Orleans, was made in 10 days. The boat moved only during the day, but made faster time than the usual freight service by rail, and the cost was 20 per cent less. Two days later the "Cairo" started on a return trip, towing six barges loaded with merchandise for upstream points.



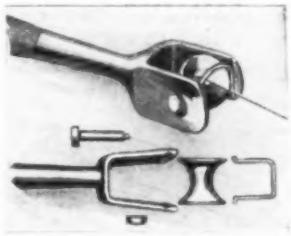
Portable Electric Furnace for Use in the Manufacture of Automobile-Body and Fender Stampings, That can be Moved from One Press to Another as Required: On Top of the Furnace Is a Transformer That Steps Down the Voltage of the Service Current to Suit the Requirements. It is Moved by a Traveling Crane

PORTABLE ELECTRIC FURNACE USED IN STAMPING PLANT

A portable electric furnace, with a capacity for heating 750 lb. of material to 1,800° F. per hour, has been installed in a stamping plant where it will be used in the manufacture of automobile-body and fender stampings. The furnace is provided with I-beam connections at the top for hooking on the crane chains, by means of which it is readily moved from one machine to another, as required. It is of 100-kw. capacity, and has a hearth 3 ft. 4 in. wide by 6 ft. 5 in. long, with a door opening of the same width as the hearth, and a height of 2 ft. 2 in. On the top of the furnace is a transformer by means of which the service current can be stepped down to the relatively low voltage required by the furnace. In the heating of the material for stamping or drawing to shape, the electric furnace, on account of its more uniform temperature, gives much better results than fuel-fired furnaces. In the latter the heat is not even, as the doors are opened frequently.

REMOVABLE-ROLLER ROD TIP AIDS IN CATCHING BIG FISH

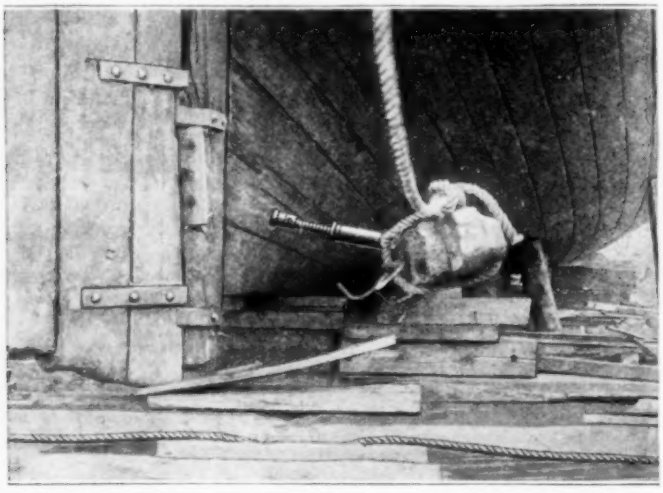
In fishing for tarpon and other large game fish, rod tips present a difficult problem to the sportsman. A removable-roller design appears to have effectively solved this problem. The old designs were the agate and permanent-roller tips. The former offered too much friction and consequent wear on the line, while the latter often became overheated. Both soon acquired grooves which cut the line. The new tip is provided with a roller which may be removed when it becomes overheated or grooved, so that a new roller can be substituted for it. Experts claim that this novel device serves its purpose in a thoroughly practical manner.



OPERATING ON A SHIP FOR "IRON SICKNESS"

By SAM E. CONNER

WHEN the 33-year-old "Lucy May" grounded at its wharf in a Maine harbor this spring, it caused no uneasiness; this had happened to the schooner many times in the course of its career. But when the tide turned it was found that the ship was filling rapidly with water. Experts were called in and pronounced the disease "iron sickness."



Renewing the Keel of the 33-Year-Old Wooden Schooner "Lucy May," the Old Keel, the Bolts of Which had been Weakened by "Iron Sickness"

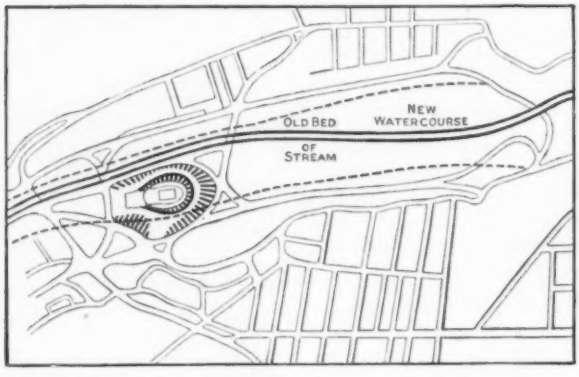
Iron sickness is a term used by seamen to indicate that the iron bolts, nails, and spikes which fasten the timbers and planking of a vessel have become so old and rusted that their strength is gone. In this instance the bolts which fastened the keel to the ship's bottom had so weakened that when the schooner settled to the bottom its weight caused the keel to roll out flat under the vessel, opening a great seam and letting in a flood of water.

The treatment adopted was to haul the schooner out on a marine railway, and by using powerful jacks pry the keel completely off the craft. The opening so made was then carefully plugged with canvas and the vessel taken from the railway cradle. New blockings were placed on the cradle and the "Lucy May" was once again taken from the water, but this time the new blocks had lifted it sufficiently to permit the putting in of a new keel. This was done, and the schooner is once more on its job as a "coaster" between Maine ports and Boston.

PASADENA STADIUM TO BE ONE OF WORLD'S LARGEST

By JOHN ANSON FORD

CHANGING the course of a river which at certain seasons is a raging torrent is one of the features incident to the construction of one of America's largest stadiums. The immense structure, work on which has begun and which will be completed next year, is to be the scene of future tournaments of roses, an annual fête for which Pasadena, Calif., has become famous. There will be permanent seats for 65,000 persons, and in case there is a demand for additional space, temporary seats can be erected across the open end, affording accommodations for 80,000 persons, all told. Some idea of the size of this structure can be gained by comparison with others, ancient and modern. The Coliseum of Rome seated 50,000 persons; this figure does not include standing



Map of the Arroyo Seco: The Dotted Lines Show the Old Course of the Stream during Floods; the Black Lines the Deepened Channel Which will Protect the Stadium against Inundation

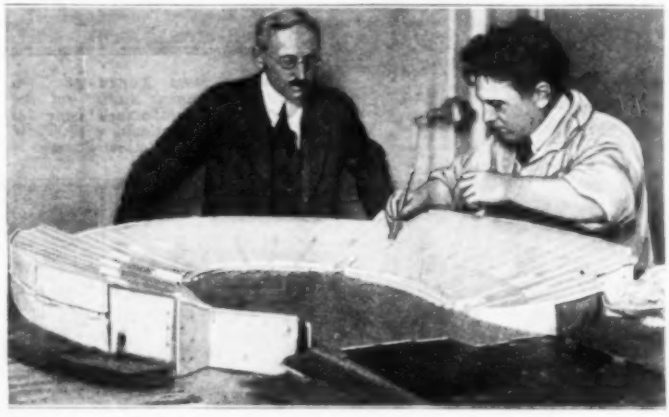
View of the Arroyo Seco, the Whole Area of Which is Flooded at Certain Seasons: The Approximate Location of the New Stadium is Indicated by the Cross and the New Wall-Inclosed Channel, That will Take Care of the Flood Waters, will Run along the Edge of the Hills to the Left

room. The Coliseum of the Yale bowl seats 78,000; the Harvard stadium, 72,000; and the Tacoma stadium, 35,000.

To provide a suitable site, a tract of 30 acres has been procured, 14 of which will be covered by the stadium itself. The site selected is located in the Arroyo Seco, on the outskirts of Pasadena, through which vast quantities of water rush during the rainy season. To protect the stadium and surrounding grounds from these floods it will be necessary to provide an artificial channel with suitably reinforced walls to confine the river. The complete undertaking involves an estimated expenditure of $750,000.

The cross section of the new structure is the same as the cross section of the Yale bowl, and the nearest spectator is the same distance from the field as at Yale. The curve of the rising seats is likewise the same, but the Yale bowl has 68 rows, or tiers, of seats, while the Pasadena structure will have 60 rows at the end and 78 at the side, where the view is the best. This makes the highest seat on the side 72 ft. above the field, as compared with 65 ft. for the enlarged Yale bowl. The inclosed field measures 275 by 475 ft. There will be room, because of the open end, for a quarter-mile running track largely within the stadium, and room for two 220-yd. straightaways, with most of the distance inside the stands.

Special arrangements have been made for handling enormous crowds by trolley and automobile. For persons coming by street car, there will be an approach 300 ft. wide, closed to all but those on foot.



Model of the $750,000 Stadium to be Built at Pasadena, California: It is Designed to Seat 65,000 Persons. With Additional Stands across the Open End, It can be Made to Accommodate 80,000

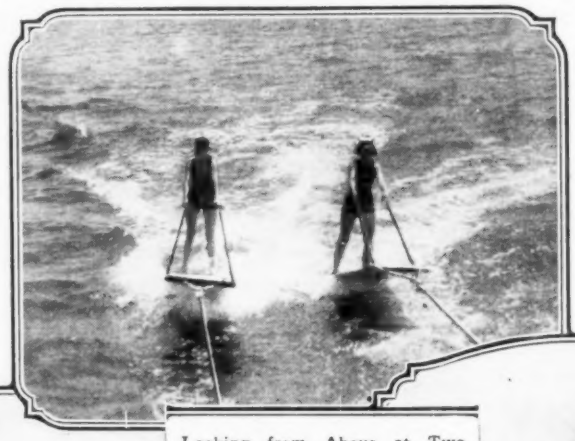
The stadium tract will be encircled by a 100-ft. highway, tapping 10 principal roads that enter the park in which it is located. Radiating from the exits will be 20 open-air parkways, each with parking space for 2,000 automobiles. These parkways will open off the encircling roadway.

The structure will be of reinforced concrete, but the seats will be of wood. Experience has shown that concrete or stone seats are not infrequently very warm or very cold, and tend to retain moisture longer than wood. It is believed the use of the latter material will add greatly to the comfort of the spectators.

The need for such a structure as this has been apparent on many occasions in recent years when the attendance at the tournament of roses has far exceeded the accommodations available. At the tournament held last January a temporary stand, seating 45,000 persons, was erected and was crowded. It is estimated that as many more persons sought admission but could not be accommodated.

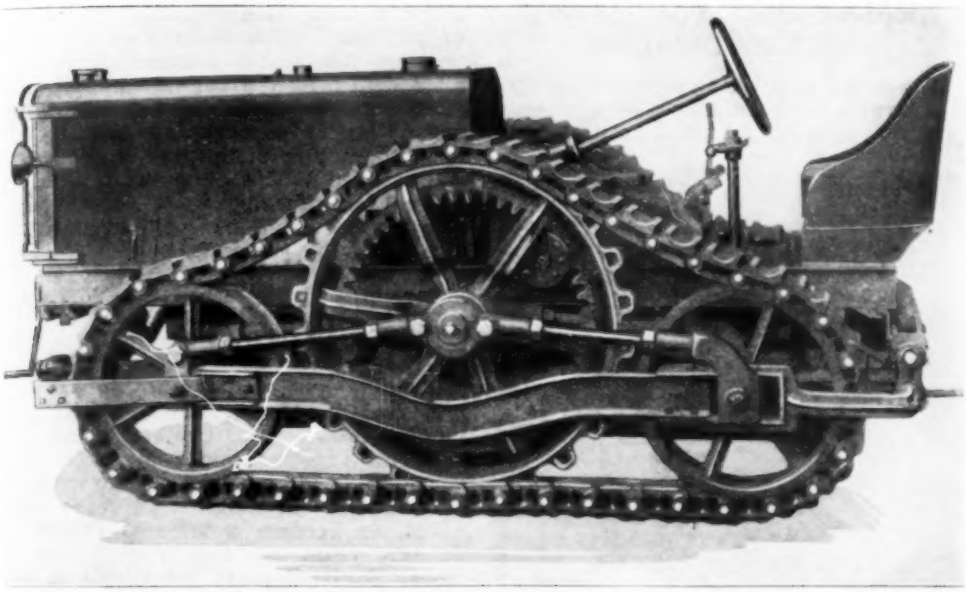
LATE IMPROVEMENTS MAKE "AQUAPLANING" SAFE

"Aquaplaning," the water sport that affords all the thrills of a swift ride over the water on a flat board drawn by a power launch, is said to be made safe and scientific by recent improvements. A sea captain has designed an "aquaplane" considerably wider than those of former design, which has three cross cleats on the underside that act as stabilizers and overcome side sway. To prevent spouting of water through the joints, the plane has been entirely covered with canvas, which also gives the rider a less slippery surface to stand on. An improved **towing** launch has also been built. It has a wide stern platform surrounded by railing, from the top of which a short ladder is suspended. Standing on the lower rung of this, the rider can mount the surf board in perfect safety when the launch has gathered fair speed.



Looking from Above at Two Water Nymphs Riding on the Improved "Aquaplanes" behind a High-Speed Launch, with Their Planes under Perfect Control

Above: A Stunt That Is Possible Because of the Control the Riders Have over Their Planes. Right: Close-Up of an Improved "Aquaplane," Showing Its Construction, with the Three Stabilizing Cleats, and the Canvas Covering That Prevents Slipping



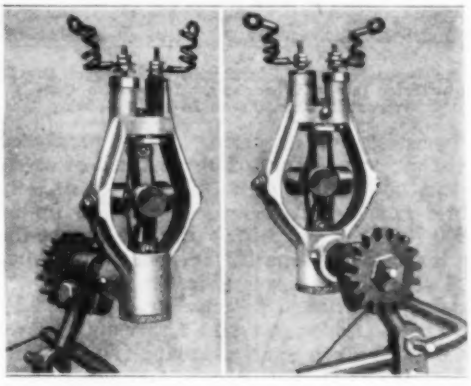
This Tractor is Driven by the Central Bull Wheels over a Flexible Track. The Hinged and Swiveled Trusses Take Up All Play. The Large Gears are Cast in Sections and Bolted to the Wheels in Such a Way That They can be Changed by an Unskilled Operator

NEW TRACTOR COMBINES BULL WHEEL AND TRACK LAYER

A combination of the bull wheel and track layer is used in a new tractor. Instead of pushing its weight with the rear wheels or pulling it with the front wheels, it balances over a central axle which drives the large bull wheels by means of internal gear. The flexible track extends the full length of the tractor and absorbs all surface unevenness. The play is taken up by swiveled and hinged trusses. This method eliminates the use of rollers in the track, with consequent reduction of trouble from dust and dirt getting into the bearings. The wearing parts are so easily replaced that an unskilled operator can make any change with the aid of no other tools than socket or monkey wrenches.

NEW AUTO-SPEED CONTROLLER OPERATES CENTRIFUGALLY

There has recently been added to the present means of limiting the speed of motor cars and trucks, a controller that is electrically operated. It applies the old hit-and-miss principle in a somewhat novel manner, by cutting out the ignition circuit, or by grounding the magneto, if that is part of the ignition system, by means of a centrifugal governor which is driven from one of the front wheels by gearing similar to that used in the installation of a speedometer. This permits the motor to maintain its full speed capacity while the transmission is at low speed,



Two Views, from Opposite Sides, of a New Auto-Speed Controller That Operates Centrifugally

entailing no loss of power at this speed. The device can also be applied to a throttle valve in the inlet manifold, which it closes at the speed limit.

¶It has been found that sheets of duralumin used in airplane construction are subject to crystallization, and for this reason, time develops weakness in this material, for which there is no known remedy.

SIMPLE DEVICE FOR LIFTING HELPLESS INVALIDS

The problem of lifting an entirely helpless invalid has been solved by a woman inventor, who has designed an apparatus

The Inventor Uses This Device to Lift Her Invalid Sister into a Wheelchair. It Is Also Convenient in Changing an Invalid's Bedding

to assist her in caring for a paralyzed sister. It is a sort of crane, built of angle iron, and weighs only 60 lb. With its help one nurse can easily lift weights up to 500 lb., or a patient, having the use of his arms, can lift himself. A harness or jacket of washable duck is placed about the patient and hooked to a pulley, operated by a chain and so geared as to require only a small pull to exert a great lifting power. The device is of great assistance in changing bedding or in lifting an invalid into a wheelchair. It will be manufactured for the market.

NEW SYSTEM OF ROAD PAVING EMPLOYS CAST-IRON BLOCKS

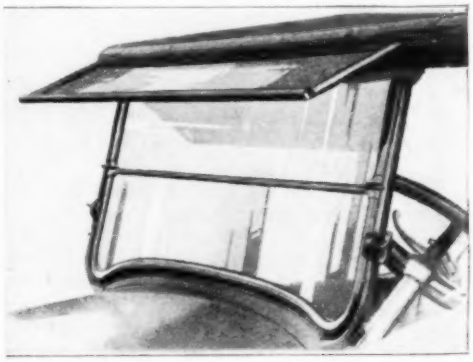
Various experiments have been made in France with a new system of road paving that have shown very satisfactory results as regards durability and maintenance costs. The construction consists of a foundation of ordinary concrete in which are imbedded hollow square blocks of cast iron. The hollows in these, as well as the spaces between them, are filled with a finer grade of concrete, finished with a smooth surface. The number of blocks per square yard depends upon the nature of the traffic. They are so arranged that they prevent skidding of vehicles, and are placed close enough to carry the whole load without any of it coming on the concrete.

FAMOUS YACHT "AMERICA" TO BE PRESERVED BY U. S.

The schooner yacht "America" is to be preserved at the Naval Academy at Annapolis, Md., by the United States government. It was bought by C. H. W. Foster and will be turned over to the government, for the nominal purchase price of $1, to become a national memorial. Seventy years ago the "America" won, from England, the "America's Cup," which has since become the classic international yachting trophy.

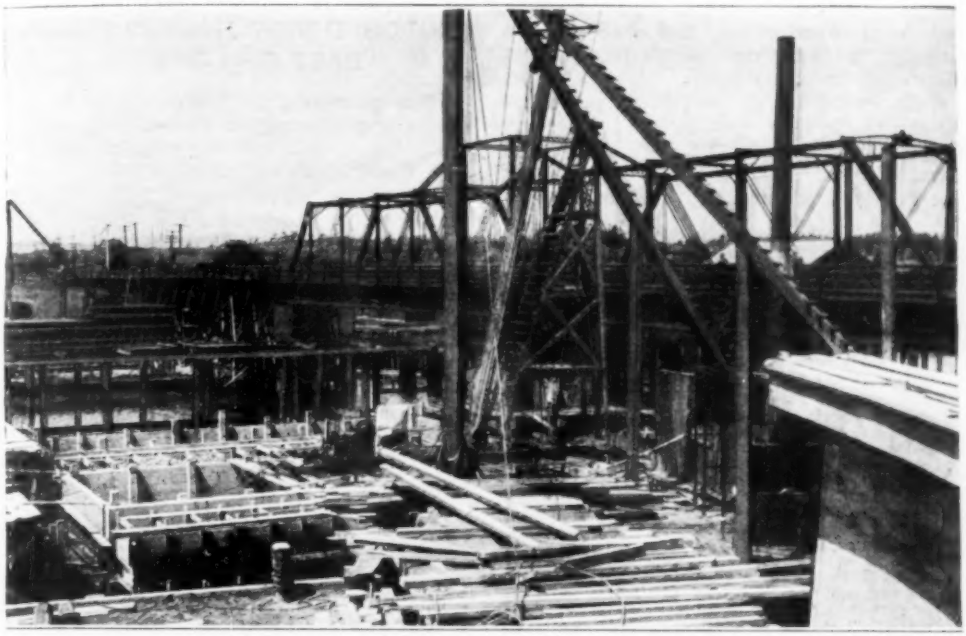
WATER-DRAINING PROTECTOR FOR AUTO WINDSHIELDS

A new all-metal windshield protector has been designed with the expressed purpose of overcoming many of the accidents which happen daily through lack of clear vision caused by rain, sleet, snow, mist, and strong lights. An important feature is the drainage gutter formed on the lower edge, which conducts the water to either side in rainy weather. The protector is made of sheet metal enameled black, and is claimed not to rattle. It is raised or lowered at will, and is made to fit all makes of windshields.



The Metal Projection above the Windshield Protects It against Rain, Snow, and Strong Lights

CANADIAN BASCULE BRIDGE BUILT AS TWO BRIDGES



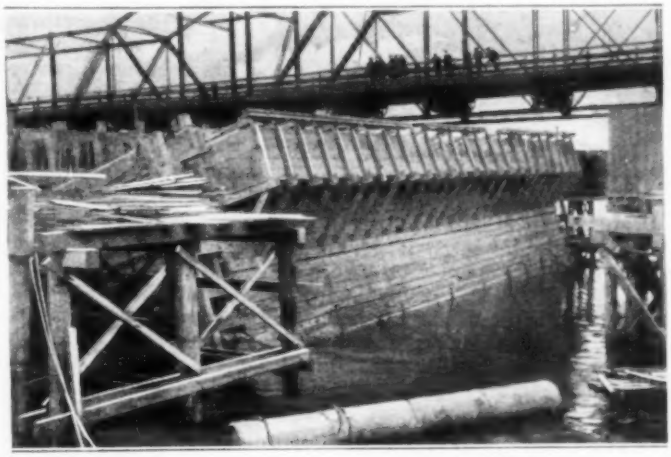
Old Railway Bridge at Victoria, British Columbia, being Replaced by a Bascule Bridge That will be Built as Two Bridges, So as Not to Interfere with Traffic during Construction: The First Bascule is Shown under Construction

A DIFFICULT problem was set for the engineers in charge of the design and construction of a new bridge to cross the neck of the harbor at Victoria, B. C., owing to the fact that it is necessary to locate the new structure on practically the same site as the old one without interrupting traffic.

The new bridge is to be of the trunnion-bascule type, and the difficulty has been surmounted by designing it as two separate bridges, the southern half, the piers for which are now under construction, being for ordinary street traffic, and the northern half, which will occupy the space now taken up by the old bridge, for railway traffic.

The highway section is to be completed first, and as street-car tracks are to be laid as part of the structure, it will be possible to use this section to accommodate the rail traffic until the north section is built. When the work is finally completed both bridges will be operated as one, from one operating house.

The piers are to be of concrete, carried well down into the harbor bed, and supported by piles driven closely together to bedrock, which is about 70 ft. below water level. A rather alarming accident occurred during the sinking of one of the open caissons, when this, suddenly and without warning, sank about 12 ft. at one edge, leaving the structure badly strained and considerably out of place. On investigation it turned out that the caisson



Accident to an Open Caisson during Construction of the First of the Bascule Bridges: The Caisson was Overloaded, and One End of It Sank 12 Feet, Which, But for Prompt Action, would have Caused Serious Damage

had been overloaded, and had broken through a "capping" of hardpan into quicksand or liquid mud.

Quick work by the engineers in relieving the strain by removing the loading on the caisson, saved the situation, and about 48 hours after the accident the big box gently lifted and righted itself.

NEW SIGNAL SMOKE BOMB FALLS VERY SLOWLY

A NEW signal smoke bomb which after being fired will hover for a considerable time in the air, assuring its observation from a distance, has been used in connection with submarine work on the Pacific coast. Attached to the smoke bomb is a parachute which opens when the bomb is fired, and retards its fall to such an extent that it remains in the air for a minute or more. Variously colored smokes are used which have different meanings.

HOLLAND PREPARES TO PUSH ELECTRICAL DEVELOPMENT

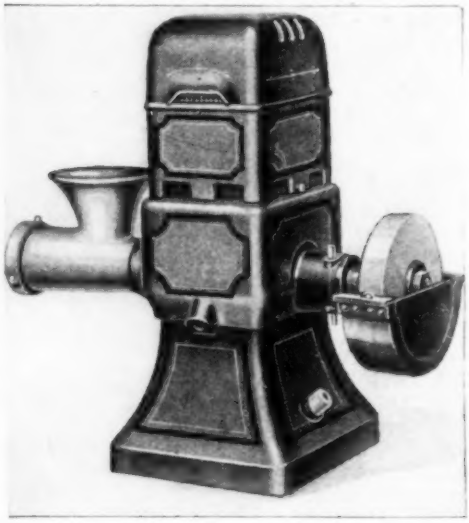
Reports from Holland show that electrical development is progressing rapidly there, including plans for electrifying the entire railway system of the country. While this project has not been definitely decided upon, a commission, appointed to study electrification in the United States and other countries, has reported favorably, recommending a system operated by a 1,500-volt direct current. The province of Zeeland, heretofore lacking general electric service, is to be supplied by a concern financed jointly by the communities and the provincial government. The commission estimates that the cost of similar service for the whole country would be approximately $2,280,000, of which $400,000 has already been subscribed. The plan is for a gradual extension of existing service.

PROPOSED NEW THAMES TUNNEL EAST OF LONDON

It is proposed to build a new tunnel under the Thames at Gravesend, east of London, to link up the railway systems north and south of the river. The tunnel would be 2¾ miles long, of which ¾ mile would be as much as 70 ft. below high-water level. The scheme would involve the building of a new railway on the northern bank of the river that would open up a direct route between the midland and northern parts of England and the European continent, without having, as at present, to pass through the congested London railroad area. The cost of the construction of the tunnel and the new railway is estimated at about 30 million dollars.

ELECTRIC MEAT CHOPPER HAS IMPROVED FEATURES

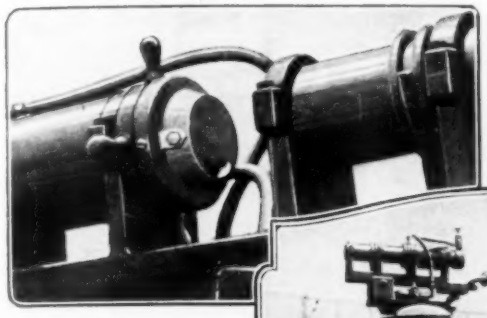
Several unusual features have been incorporated in a new electric meat chopper. An improved grinding cylinder eliminates all chance of the hand becoming caught and injured. The motor shaft extends on both sides of the housing, the chopper being permanently mounted on one end, while a grindstone, coffeemill, or bone grinder may be attached to the other, and used without interfering with the operation of the meat chopper. The motor can be run with equal efficiency on either direct or alternating current.



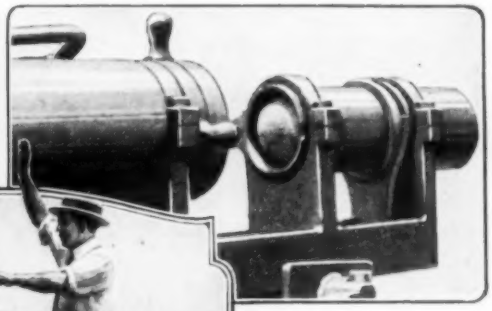
This Electric Meat Chopper can be Operated on Either Direct or Alternating Current. A Grindstone may be Used at the Same Time

BASEBALL-PITCHING MACHINE USES COMPRESSED AIR

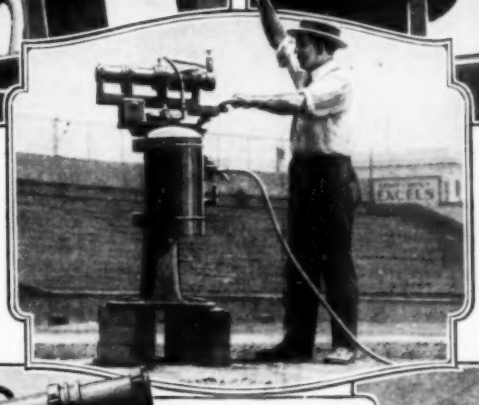
By FRANK B. HOWE

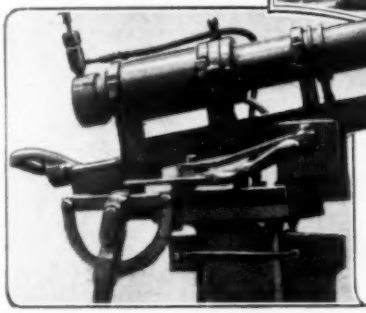


Above: The Gun Is Open, Showing the Revolving Turret Which Permits the Air to be Applied on Any Side of the Ball to Throw a Curve. Below: A Side View of the Gun; the Trigger Which Releases the Ball can be Seen on the Top

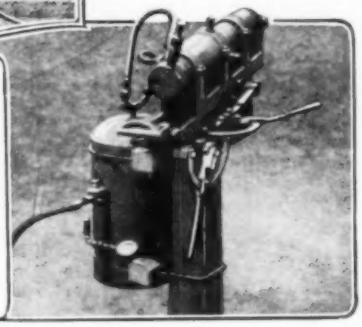


In the Upper View the Ball Is in Place Ready for the Gun to be Closed. The Two Parts Slide Tightly Together, Forming a Perfectly Air-Tight Joint. In the Center, the Machine is Shown Set Up Ready for Use, on the Pitcher's Mound





On the Right, the Levers for Controlling the Up-and-Down and the Side Movements of the Gun in Aiming can be Seen, as Well as the Lever at the Back by Which the Gun is "Broken" for Loading. At the Left Side of the Pedestal Is the Compressed-Air Tank



AN ingenious machine for pitching baseballs, which will throw any of the curves that man can throw and never a wild ball, is operated by compressed air. A compressor, sunk in the pitcher's box, supplies the air to a tank on the machine. It can be applied to the ball at any pressure, according to the speed desired. Sixty pounds has been found to give the speed of a ball pitched by the average man.

By means of a lever, the gun is "broken" in the middle, for loading. Other levers move the gun laterally and vertically for aiming. A trigger placed on the top releases the ball. This is accompanied by a sharp report. It is the inventor's practice to signal just before pressing the trigger, in order to give the batter the warning ordinarily given by the pitcher's "wind-up" which precedes the throw.

The machine has a revolving turret, on one side of which is a hole for the passage of air. To accomplish a curve, air is applied to one side of the ball, causing the whirling motion which results in a curve. By revolving the turret, air may be applied to any side of the ball and any kind of a curve in a star pitcher's repertoire may be easily obtained.

Thorough tests of the machine, which seem to demonstrate its entire practicability, are being made. It is expected to prove of great value for necessary batting practice, which often wears out a pitcher and lessens his value in games. By the use of the machine any amount of batting practice can be had.

"FRENCH SAMPLE TRAIN" TO AID BLIND SOLDIERS

A special train, exhibiting the products of France, is touring Canada this fall. The "French sample train" is also showing motion pictures of the scenery, historic monuments, architecture, and art of the country. The proceeds will be devoted to the blind soldiers of France or other war sufferers.

CARRYING CASE FOR MONEY BEARER HAS ALARM LID

A money-carrying case for bank messengers and others, sounds its own alarm if the bearer is held up. The case has in

With This Money-Carrying Case, the Bearer may Sound an Alarm When Held Up. An Electric Gong in the Lid Rings When a Trigger in the Handle is Depressed. Left: Case as It Appears When Carried. Right: Lid Raised, Showing Gong and Operating Mechanism

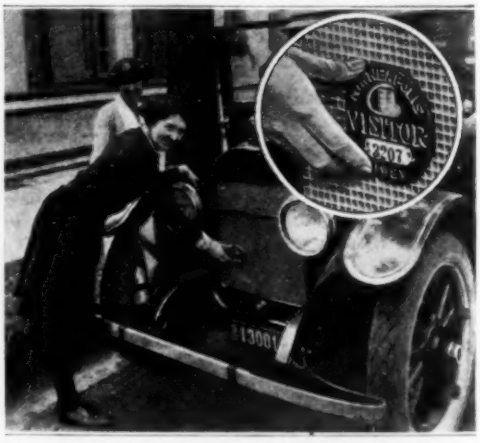
its lid a good-sized gong and two circuits operated by means of triggers in the carrying handle. If the unlucky messenger wishes to sound an immediate alarm, a slight pressure on one trigger is all that is required. If he should consider it expedient that the hold-up man be some distance away when the alarm rings, another trigger sets a plunger which starts the alarm after a predetermined interval. The alarm will ring for six hours continuously. As a consequence, so much unexpected attention is attracted to the thief that he is apt to discard his noisy loot and run. The triggers operate pneumatic plungers which in turn operate an electric switch. The plungers are recharged with compressed air when the circuit is broken, which can be done only after the box has been opened.

CURIOUS FACTS ABOUT RIGHT AND LEFT-HANDEDNESS

From scientific observations of left-handedness in relation to high blood pressure, some very interesting disclosures have recently been made. The observations were made with regard to this point on 142 inmates of the San Francisco home for the aged. Left-eyedness is not uncommon in the right-handed, it was pointed out. Conversely, right-eyedness is common with left-handed people. Among 600 men between the ages of 44 and 89, there were found 42 left-handed ones, of which 14 were left-handed and left-eyed, and the remaining 28 "crossed"; that is, either left-handed and right-eyed, or left-eyed and right-handed. Higher blood pressures and stammering were found to be more frequent among left-handed individuals.

WELCOME TO MOTOR TOURISTS EXTENDED BY MINNEAPOLIS

When an automobile with the license number of another state, drives through Minneapolis, it is stopped by a policeman. But the driver is not arrested. Instead he is given a card inviting him to the automobile club where tourist headquarters is maintained by the various civic organizations of the city. Here he is registered and given an envelope containing a copy of the state traffic laws, a map of the city, and a road map of Minnesota resorts. A tag is attached to his car and he is advised that it will insure him the courtesy of the city, and that he will not be held liable for any minor violations of the traffic laws, into which a stranger is so likely to blunder. He is urged to make

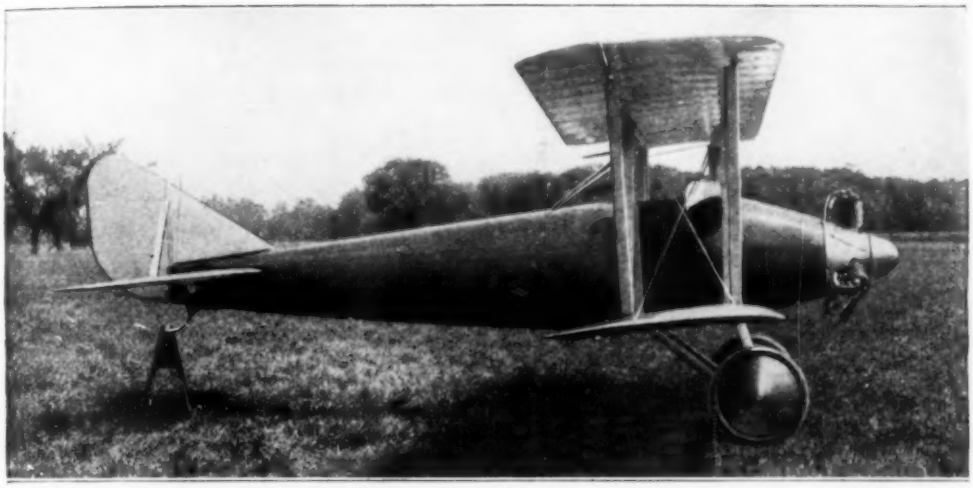


Tourist's Car being Tagged at the Minneapolis Tourist Headquarters: The Tag Insures the Hospitality of the City to the Visitor

use of the information bureau while in the city. Practically all the motorists given the cards go directly to the bureau.

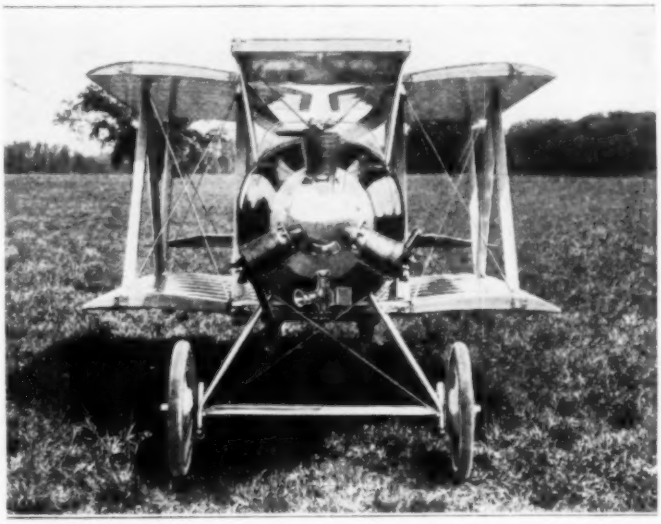
¶ At a recent meeting of the American Electrochemical Society there was described a storage battery which, by the use of extra-thin plates, gave, per unit of weight, an electrical output 50 to 200 per cent higher than the standard batteries.

NEW PLANE AIMS TO BE "FLIVVER" OF THE AIR



A Side View of the Model Airplane Which might be Called an "Air Flivver." It is Expected to Make Flying Almost as Common as Automobiling. It Easily Carries Two Passengers, Though Extremely Small and Light

An airplane which is expected to bring flying within the reach of the person of average income, has been designed and built by a Topeka, Kan., man. The plane, it is claimed, can be produced and sold for the price of an ordinary automobile, and housed in a small automobile garage. The wings are so constructed that they can be folded back, making the width only 8 ft. 9 in. About 30 seconds are required to fold or unfold the wings. When spread, the wings measure 18 ft. from tip to tip. The height is 7 ft., and the length, 19 ft. The plane weighs only 500 lb., is equipped with a 60-hp. motor, and has a carrying capacity of 500 lb. It is built to carry two passengers sitting side by side. On its test flight it left the ground in 125 ft. and landed with a 75-ft. run. This means it can take off and land in an ordinary-size lot.



The Plane with the Wings Folded Back Is Only 8 Feet 9 Inches Wide, 7 Feet High, and 19 Feet Long. An Ordinary Automobile Garage Is Large Enough to be Used as Its Hangar. The Extended Wing Span Is 18 Feet

STEEL-CHANNEL MINE PROPS IN PLACE OF WOODEN ONES

Posts made of standard steel channels, in place of the ancient wooden props, are becoming the regular thing in the mines of the Ruhr basin, Germany. These steel props are in the form of an adjustable rectangle. They are used especially in shales, which are apt to cave in. The use of the metal props is now particularly economical on account of the abnormal cost of timber, and through the reduction of labor cost, because their much longer life obviates the frequent replacement which the older method necessitated.

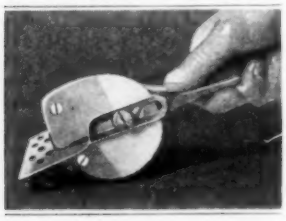
SCREEN HAMMOCK FOR BABIES ON AUTOMOBILE TOUR

A hooded swing for babies, designed especially for use on automobile tours and camping trips, has a wood bottom and side supports, which give it form, and a canvas-lined screen top and sides for light and ventilation. Two upper end flaps support the cage from a rope by means of metal rings. The hammock is sufficiently large to allow the infant to move around, and at the same time is of such form as to be easily transported on the running board of the car.

This Hammock for the Baby, with a Wooden Bottom and Side Supports to Give It Form, is Made of Canvas, and Has Screens on Sides and Roof

NEW SHEET-METAL PUNCH IS HANDY FOR TINNERS

A hand-operated sheet-metal punch with improved features has recently been designed for the tinsmith. It consists of an ordinary punch frame, handle, and operating arm, with the addition of an adjustable gauge for regulating hole-line distances. The gauge is at the rear of the punch throat and when the metal sheet is inserted, acts as a stop. The operating arm is then depressed and a hole made by a quickly removable punch and die combination. Holes up to 1/4 in. in diameter may be made through No. 18 gauge sheet metal by the device.



LONDON UNIVERSITY TO GIVE COURSE IN ESTATE MANAGEMENT

An important step in the recognition of town planning and estate management as among the applied sciences, has been recently taken in England. A college of estate management will be opened in the autumn in affiliation with the University of London, with the object of not only training students in attendance in the science of estate management but extending knowledge to practitioners through the use of correspondence courses.

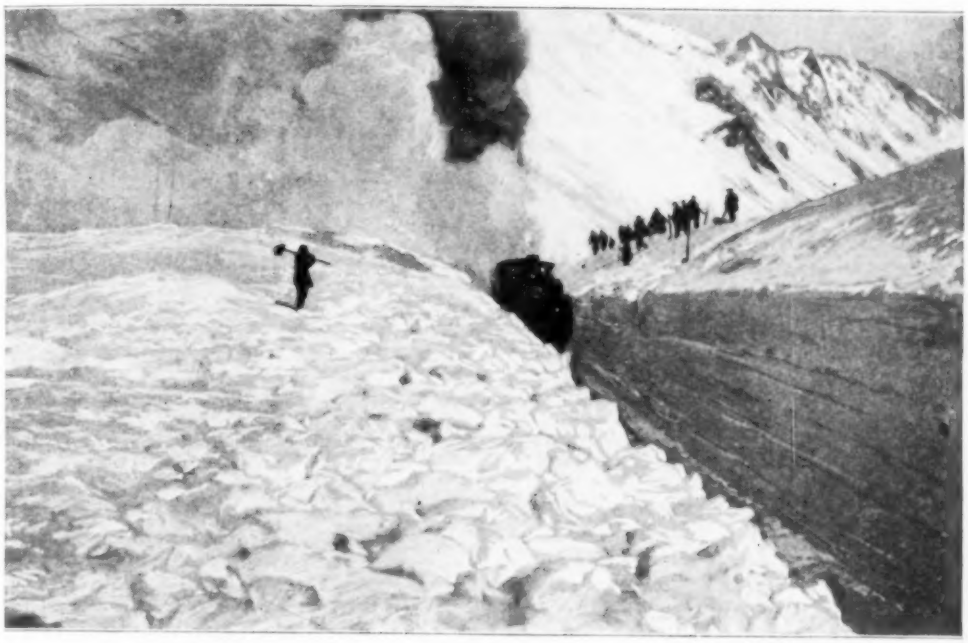
The courses given cover land surveying, the valuation of land and buildings, agricultural law, and forestry for those who might be called to practice in the country; town planning, urban sanitation, and municipal and local-government law, for students particularly interested in urban development.

NEW ATTACHMENT INCREASES VALUE OF DYNAMO LAMP

An improvement in the French generating flashlight, described in the June issue of Popular Mechanics, has been worked out recently in England. The new form may be held in one hand and the dynamo rotated by finger pressure. An extension plug has been added which enables the operator to secure light from a second point at the same time. Another model is set on a small folding tripod and operated by the foot, leaving both the user's hands entirely free for whatever work he wishes to do.

Pressure on the Lever Rotates the Dynamo, Furnishing Current for the Flashlight

TRANSANDEAN RAILWAY'S WINTER HANDICAP



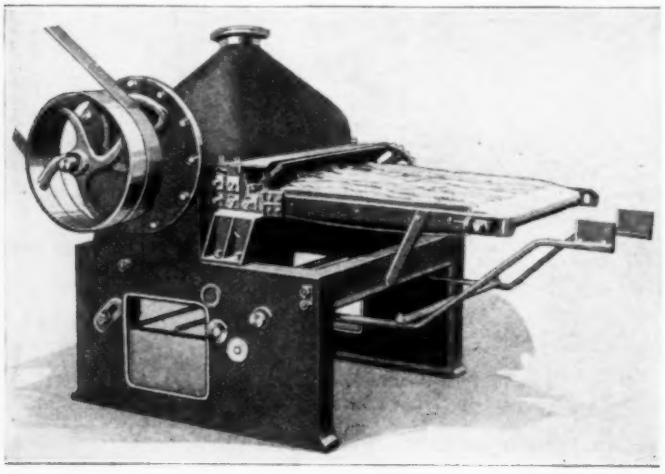
Above: A Rotary Snowplow Making the First Cut in the Andean Pass. It is Followed by Gangs of Men Clearing by Hand

Below: A Cut through One of the Big Mountainside Drifts on the Steep Rack Line, Showing How Effectively the Plow Does Its Work

The transandean railway which connects Argentina with Chile crosses the Andes Mountains at a height of 10,530 ft. above sea level. The mountain pass at this point is 12,795 ft. above sea level, but the railroad passes through a tunnel two miles long to avoid the steep grade and shorten the route. During the winter season, from June to October, heavy snowstorms occur in the mountains, and it is sometimes impossible to keep the road open to traffic. In 1919, the line was out of service from May until October, owing to the continual snows, and hundreds of sacks of mail from the United States destined for Argentina were delayed in Chile. This year the first snow occurred late in May and it took two weeks to clear it away to allow a train to pass. Another storm followed on June 14, again tying up traffic.

MECHANICAL FLAX SCUTCHER ELIMINATES HAND LABOR

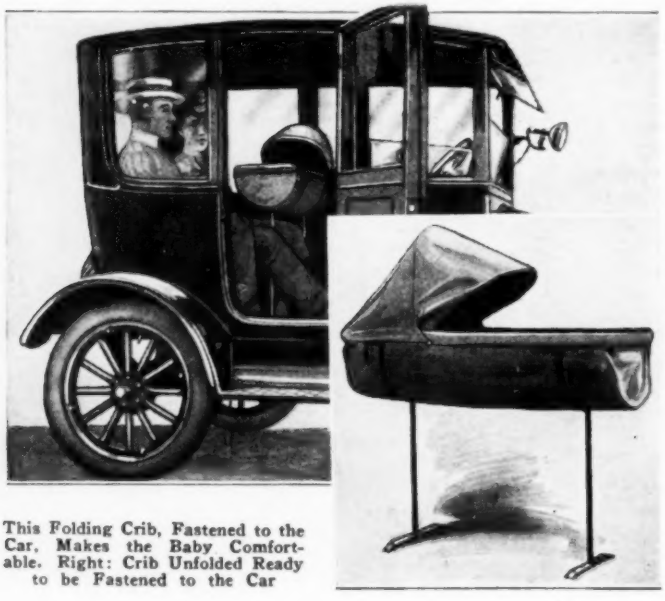
The stripping off of the straw, or woody coat, of the flax stem, necessary before the fiber can be obtained, has been the subject of considerable study. Breaking it by hand was for a long time the common practice. Then an abrasive stone, which practically ground off the undesirable surface, came into use. The requirements of the air-craft industry in England during the war called for economies and production beyond the limits of the "hand and wheel" method, and so a mechanical scutcher was invented. It consists of a series of long cylinders radially mounted upon revolving disks. The cylinders have lateral blades and are driven by a planetary gear which makes them revolve as they in turn swing in about the center of the disks. Below, and meshing with these cylinder blades, is a similar set of blades. Thus, as the flax stems come between the cylinder and blades, the woody exterior is stripped and dropped into a receptacle below. Suitable breaking rolls prepare the flax for the scutching operation.



In This Machine, the Straw or Woody Coat of the Flax is Broken Off between Revolving, Bladed Cylinders and a Bladed Grid. Breaking Rolls Prepare the Flax for the Cylinders

FOLDING AUTO CRIB FOR BABY'S COMFORT

Mother can now drive her car with baby tucked away and cooing comfortably at her side. This new development is a folding auto crib, weighing about 14 lb., which can be fastened in any desired location. The two hollow legs of the crib are held in position by latches which, when sprung, allow the legs to fold inwardly. The top, which is hooded, can be folded into a neat, compact package. Each leg contains a coiled spring designed to take up the shock and recoil. The legs are fastened to the car by means of bolts inserted through holes drilled in the floor. The bolts are covered with a small section of channel iron to give a neat finish. Because of its compactness, the crib requires but little of the car room. It can be installed in any machine.



This Folding Crib, Fastened to the Car, Makes the Baby Comfortable. Right: Crib Unfolded Ready to be Fastened to the Car

"HYDRAULIC JUMP" PREVENTS FLOOD-WATER DAMAGE

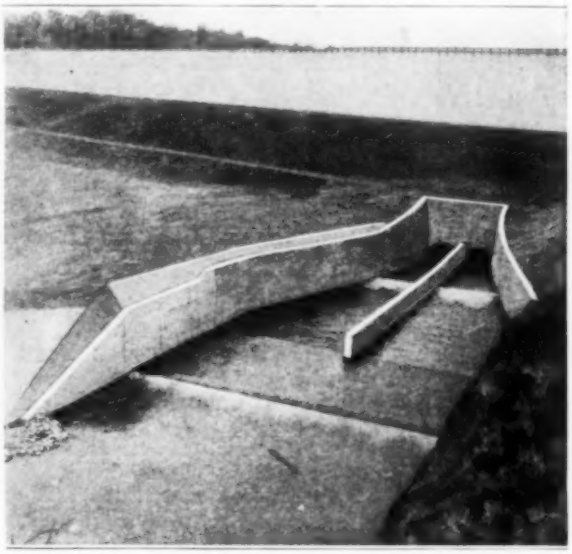
By GEO. F. PAUL

RECENT severe rainstorms in the Miami River and Twin Creek districts of Ohio have fully demonstrated to the residents of Hamilton and Middletown the excellent protection afforded them by the flood-prevention works at the Germantown dam. The most severe storm backed up the water behind the dam to a height of 37 ft. above the conduit floor. A lake was formed that reached four miles up the valley and was estimated by officials of the Miami Conservancy District to be equivalent to 613 acres flooded 10 ft. deep.

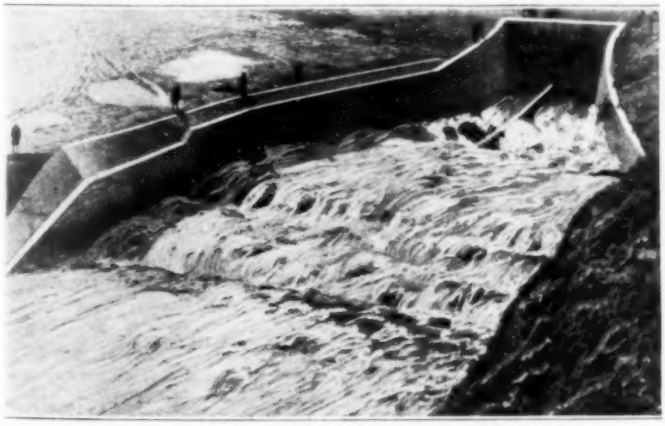
When the flood was at its highest, the water rushed through the dam conduits at the rate of 28.8 ft. per second, or 20 miles an hour, and discharged at the outlet 5,250 cu. ft. of water a second. The volume of water that came plunging from the outlets every minute was estimated as equivalent to 195 freight cars of 100,000-lb. capacity each, traveling at the rate of nearly 20 miles an hour.

It was to conquer and tame just such a raging and destructive flood as this that the conservancy engineers developed and installed what they term the "hydraulic jump." This was the biggest problem connected with the entire project and called for repeated trials and experiments with working models until the right type was determined upon.

What the engineers did was to provide a deep and wide pool where the rushing waters might lose their strength and fury, and then roll on in comparative peacefulness down the valley. The conduits were widened and deepened into a big basin, built of concrete and bedded in the solid rock. Thus was provided the cushion to receive the first blow of the rushing waters. To simulate artificial obstructions like those interposed by stones and rocks in a brook, the bottom of the concrete basin was purposely roughened through the building of irregular steps in the descending floor. These obstructions take the form of two submerged walls that extend across the full width of the outlet basin at its downstream end.

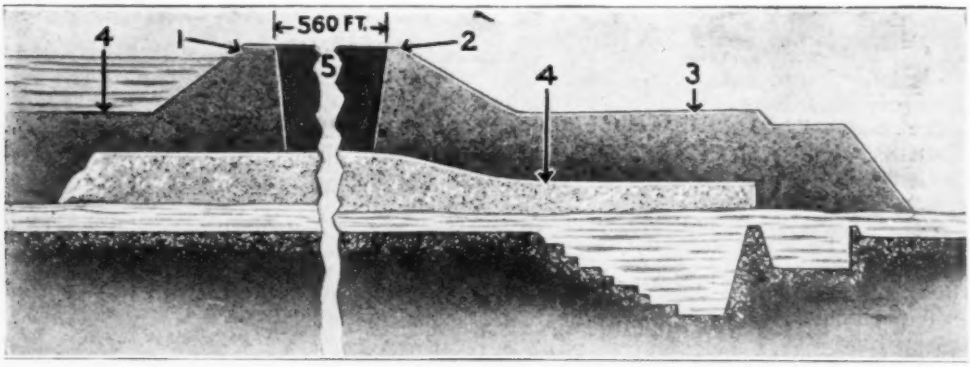


Conduits under the Germantown Dam: The Narrow Strip of Foam near Their Mouth Indicates the Location of the "Hydraulic Jump"



Outlet Conduits of the Germantown Dam, Showing How They Handled the Recent Flood: The Great Size of the Conduits is Indicated by Comparing Them with the Men Standing along the Far Wall

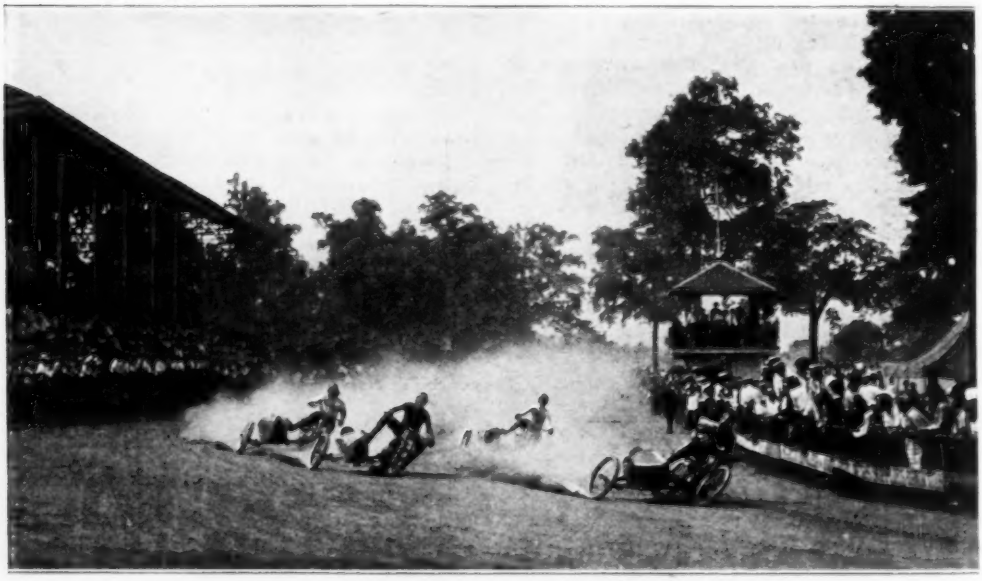
The so-called hydraulic jump is formed where the rushing current strikes the still waters of the pool. This is often noticeable where a sheet of water slips over the level crest of a dam and strikes the water below. The down-rushing water forms a wave that forces the water below to a higher level. However, this wave is peculiar. In-



Longitudinal Section through Germantown Dam Conduits, Showing Hydraulic Jump: 1, Top of Upstream Head Wall; 2, Top of Downstream Head Wall; 3, Top of Side Wall; 4, Top of Partition Wall; 5, Dam, Actually 560 Feet Wide, Here, for Convenience, Shown Broken

stead of rushing onward it stands still. The term hydraulic jump is intended to describe this peculiar appearance.

By compelling the rushing water to lift a mass of water below, and by means of friction, the jump kills the destructive energy of the rushing torrent. In the conduits the water is closely confined, but in the pool it is spread out, and thus the speed may be said to be "diluted." The water, as stated, came rushing out at a speed of nearly 29 ft. per second; in the creek below the jump it traveled onward at a speed of only 5.5 ft. per second. The ratio of the two speeds is approximately 5 to 1, but the destructive power is as the squares of the speeds, or 25 to 1. In other words, 96 per cent of the energy was killed when the water struck the hydraulic jump.



THRILLING MOTORCYCLE RACE AT HAMILTON, OHIO

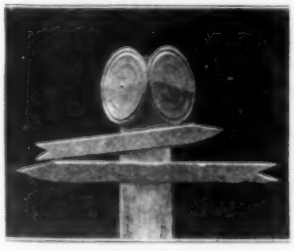
MOTORCYCLE racing over dirt roads has been very popular this year. Although speedways have been built and magnificently equipped for the highest class of automotive races, it seems that the dirt courses were the greater attraction. Novelties of all kinds were often included in these races, and the picture above shows a race held at Hamilton, Ohio, recently, in which sidecars were used. The contestants are seen rounding a curve at a terrific rate of speed and with apparently little effort. It will also be noted that they are leaning inward more than ordinarily. This is made possible by the use of a flexible wheel on the sidecars. When approaching a curve, as shown in the picture, the racer bears against the side of the car body with one leg, exerting this pressure so as to force the outfit to lean at a greater angle. This overcomes the friction occurring when sidecars with rigid wheels are used, and increases the speed possibilities of the unit.

HEAVY CRANE TRANSPORTED TO MEXICO IN RECORD TIME

Twenty-six days after an urgent call for the shipment of a large boom crane to Mexico, the big machine was at work in its new location. Immediately upon receipt of the order, the crane was loaded at a Toledo, Ohio, plant and hurried by rail to Port Arthur, Tex. Here a big tanker, already under steam for the trip, picked up the boom of the crane and loaded it aboard, while a track of 12 by 12-in. timbers was laid to transport the crane to the deck. After providing the crane engine with gasoline and oil, the machine was moved to its place aboard under its own power. Upon arrival at Tampico, Mexico, the two 12 by 12-in. timbers again served as roadway, and the crane walked off as it had been brought aboard. It made the balance of the trip by its own power, and on arrival at the destination at once started on its job.

POSTS GUIDE TOURISTS IN REDWOOD FORESTS

Because of the frequency with which tourists in the big-tree country of California got lost, a novel system of guide-posts has been installed. The posts are set at frequent intervals through the forest, a red and a yellow arrow-shaped board being nailed to each post. The red arrow indicates the way to the hotel, while the yellow one indicates the way away from it. To enable the tourist to locate the posts easily, brilliant-colored bull's-eyes are nailed to their tops. A sight-seer can now start out in the morning and wander at will; when he is ready to return to the hotel he seeks one of the posts and follows the arrows back to the hotel without help of a guide.



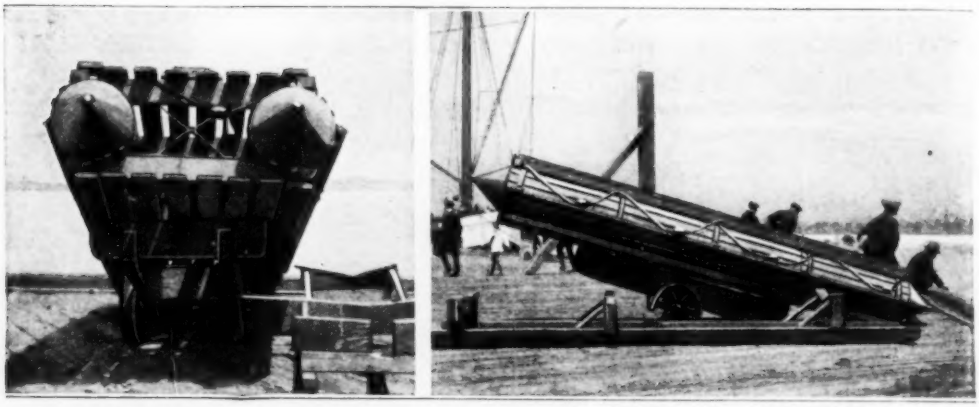
PLATFORM ATTACHED TO AUTO CARRIES MOVIE-CAMERA MAN

To facilitate the photography of parades, crowds, and other moving objects, a special platform for attachment to an automobile has been designed. Upon this platform the camera man rests his camera and tripod at a sufficiently elevated level to enable proper perspective, elevation, and choice of viewpoints. The platform is of square, wooden construction, and is fastened to the running boards of the automobile by means of four bolts, which are quickly removable.

The Platform is Held in Place on the Auto Running Boards by Four Bolts Which may be Quickly Detached. It Allows Choice of Perspective and View

SUBMARINE LIFTING MAGNET RECOVERS SHIP'S WRECKAGE

For the purpose of lifting masses of iron or steel plates, forming parts of ships that have been wrecked, a special submarine magnet has been designed and tested in England. The actual lifting power of the magnet is from 10 to 15 tons, according to how good a hold it gets on the material, with a current of 16 amperes at 220 volts' pressure. The magnet weighs only 700 lb. Tests were made at a dock with a muddy bottom, and at one demonstration a piece of steel plate, 4 in. thick, a complete railway crossing, a piece of boiler plate about 6 in. square, and I-beams clamped together, weighing 2½ tons, were dropped into the dock in 30 ft. of water, where they were completely invisible. All were recovered from the mud by searching for them with the magnet.



Front and Side Views of Raft Used on the Docks of a California Port to Replace the Usual Life Preservers: It Is of Rigid Construction, as Distinguished from the Common Slung Type, and is Mounted on a Two-Wheeled Truck for Quick Transportation and Launching at Any Point Where It may be Required

SCIENCE MAKES SILK PURSE FROM A SOW'S EAR

Science has a way of accomplishing things that have always been accepted as impossible. Another demonstration of this fact has disproved the old adage, "You can't make a silk purse out of a sow's ear." This has been actually accomplished by Dr. Arthur D. Little, an American chemist. A sow's ear is composed of a material from which can be produced cellulose similar to that used as a base in the manufacture of artificial silk. Doctor Little first extracted a glue from the gristle and skin of the sow's ear and developed a hardening process by which he was able to produce an artificial silk fiber. This was spun, dyed, and made into a purse, which was exhibited at the recent National Exposition of Chemical Industries.

This Purse, Made from a Sow's Ear by the Method Used in the Manufacture of Artificial Silk, was Exhibited at the National Chemical Exposition

LIFE RAFTS ARE INSTALLED ON CALIFORNIA DOCKS

The only provision for accidents ordinarily made on docks and wharves is the common doughnutlike life preserver. A California seaport, realizing the inadequacy of these, especially in such cases as the breaking of a gangplank when a number of persons are likely to fall into the water at once, has installed life rafts mounted on trucks for instant transportation and launching. The raft, though about the size of those commonly used on ships, differs considerably in construction. It has a double-deck body made of slats with a central cockpit for passengers. This is rigidly mounted on the pontoons, instead of being slung from them. The buoyancy is sufficient to support a large number of persons, making it of much greater value than the battery of ordinary life preservers, though its cost is probably not much greater. This is said to be the first time life rafts have been used on docks, though ships have carried them for many years.

SOLID-CONCRETE SHAPES CENTRIFUGALLY CAST

Heretofore, centrifugal casting of concrete has been confined to the manufacture of hollow objects. Machinery is now designed whereby either hollow or solid shapes may be made. Basically, the machine is a bowl-shaped housing fitted with the necessary means of rotating it. Within is a central pouring chamber communicating with a series of radially disposed mold sections. The wet concrete is poured into the central chamber and the entire unit rotated for from one-half to three minutes, during which time the mixture enters the mold and sets in place. The mold is then opened and the cast article taken out. The machine lends itself as readily to the making of hollow or reinforced pieces, as a core or reinforcing material can readily be placed in the mold before pouring.

FINE HIGHWAY BUILT FOR FREIGHT TRAFFIC ONLY

By EMMETT CAMPBELL HALL

BESIDES being world-famous as a winter-resort region, Palm Beach County, Florida, is noted for its progressiveness, particularly in the matter of highways, and enjoys the distinction of having built one road which is undoubtedly the only one of its kind in the world—a strictly modern, hard-surfaced highway intended and used solely for freight traffic.

This highway is about five miles in length, extending from the town of Boynton south to Delray, and is built upon the top of the embankment formed by the spoil thrown up in the construction of the Florida Coast Line Canal. Between this canal and the Atlantic Ocean is a strip of land, averaging a half mile in width, which, except for the ocean beach and a sand ridge running parallel with it, is enormously productive of winter vegetables, notably tomatoes, string beans, and cabbages.

This Highway Is Five Miles Long. It is Used Solely for Hauling the Truck Produced in the Gardens Which Border Its Entire Length. There Is Not a Single Residence on the Road

This land is very low, however, being but a couple of feet above the normal water level, and as the soil is for the most part pure muck, considerable difficulty was formerly experienced in getting out the thousands of crates of produce, a horse finding the going difficult, and a motor truck impossible. To meet this condition, the road upon the canal embankment was built. Its foundation consists of a hard coral rock from near-by quarries, with an asphalt binder, and a top dressing of hot oil and sand, a road-building method which has proved remarkably satisfactory in this region and economical in upkeep, the traffic being almost exclusively motor vehicles. Over this road the enormous truck crop is now moved easily and quickly to the railway stations at Delray and Boynton.

Gathering Tomatoes in the Shade of Coconut and Banana Trees at Christmas Time: The Rich Muck Lying between the Road and the Beach Is Enormously Productive of Winter Tomatoes, String Beans, and Cabbages

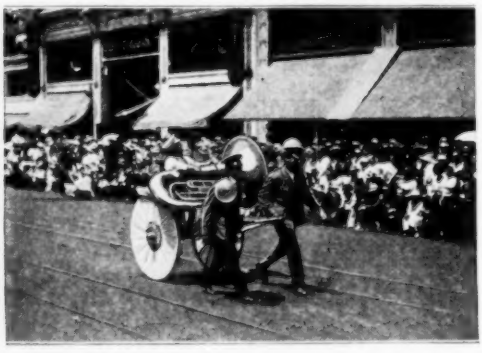
Owing to the fact that land along this road is absolutely unsuited for residential purposes—there is not a single house on the entire five-mile stretch—no idea was ever entertained that the road would serve any other purpose than the transportation of truck crops, since a road already existing handles the direct north and south traffic between the two towns, and another along the ocean front serves the residences built upon the ocean ridge. There are thus three parallel roads, a half mile apart, but without any connection whatever.

The freight road is, however, a popular driveway for winter visitors, lying as it does on the bank of the picturesque canal and bordering on mile after mile of luxuriant vegetable farms interspersed with clumps of rubber trees, lines of broad-leaved banana plants, and rows of stately coconut palms.

Throughout Palm Beach County, where the work of building an extensive system of drainage canals is progressing rapidly, highways are now being built upon the top of the spoil banks, the spoil, in many places, affording all needed stone.

BASS HORN RIDES ON VEHICLE INSTEAD OF PLAYER'S BACK

In most parades, the bass or big-horn player, as he is often called, has most of



This Bass-Horn Player Had an Easy Job in the Parade. He Was the Only Member of the Band Who did Not have to Walk

the hard work to do. He trudges along blowing and carrying the monster horn at the same time. During a parade held in the West recently, the scheme was somewhat changed. The big horn was pulled along on a two-wheeled cart which also carried its player, while the rest of the band marched as usual.

NEW HIGH SCHOOL COMBINES GYMNASIUM AND AUDITORIUM

When the new south-side high school in Fort Wayne, Ind., is completed, it will possess a feature that, so far as can be determined, is unique in the United States. This is a combination gymnasium and auditorium conceived and designed by the superintendent of schools.

The auditorium and gymnasium are recognized necessities in school construction, but when both are built separately it means that one or the other will be out of use practically all the time, for only very rarely does it happen that a school event requires the use of both at the same time.

The floor of the combined room is to be 55 by 105 ft. in size, which is larger than the largest of basketball courts, and of sufficient area to take care of several large "gym" classes. On each of the four sides of the floor will be a tier of seats, altogether accommodating 2,400 persons, and every seat will give an unobstructed view of the entire floor.

The tier at one end of the hall will be removable, and runways will be built, on which to take out the seats and slide in a specially constructed stage, large enough for the presentation of plays, or for commencement exercises and other school events. This arrangement will convert the erstwhile gymnasium into a spacious auditorium capable of seating 2,000. Space will be used with the utmost economy in this combination auditorium and gymnasium. Under the three fixed rows of seats, on two sides of the floor, and the two at the end opposite the stage, there will be dressing rooms and shower baths, sufficient to take care of 100 boys at a time, besides offices and storage rooms for apparatus.

ROTARY CHRISTMAS TREE IS NOVEL DECORATION

It has been the custom for some time, to light Christmas trees with electric bulbs, but to have the trees rotate in its radiant brilliance, is a new departure. Such rotation can now be accomplished by the use of a cast-iron cup set on the top of a shaft, and equipped with setscrews to hold the tree. The tree is set in this cup, and is turned around by a small electric motor. Power for illumination is transmitted through a sliding contact in the cup, which produces a constant, unflickering light.

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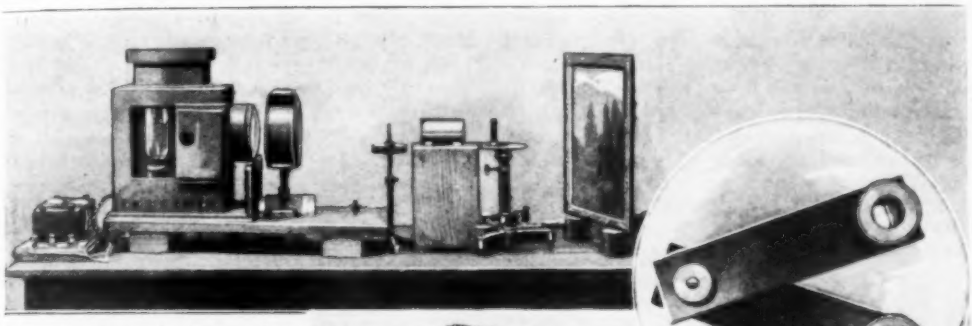
DEVICE SHOWS OLD PAINTINGS IN ORIGINAL COLORS



The Complete Apparatus for Illuminating Paintings with Polarized Light, to Show Them in Original Colors

The Operator Views the Painting through a Nicol Prism, in This Case an Ordinary Single Tube. The Insert Shows the Improved V-Shaped Nicol-Prism Binocular

It has been claimed that the beauty of old oil paintings is enhanced by the darkening of the pigments which occur in the course of centuries. This claim has been contested, but the question has never been settled. A discovery by the French scientist, M. Pierre Lambert, has made it possible to view paintings as they originally appeared, by means of polarized light. An intense light from an arc or incandescent lamp of low voltage is inclosed in a lantern provided with a condenser, followed by a lens which makes the rays parallel during their passage through the polarizing apparatus, a Nicol prism. A diverging lens then enlarges the pencil of luminous rays and lights up the entire picture, the plane of which is almost normal to the axis. The observer, looking through the Nicol prism, is able to find a position in which the superficial reflections are completely suppressed. Old dull pictures become perfectly distinct, colors more intense, and details otherwise almost invisible assume the value they had when originally painted. M. Lambert has invented a V-shaped Nicol-prism binocular which advantageously replaces the single-tube prism, since it dispenses with any turning of the prisms to the "position of extinction."

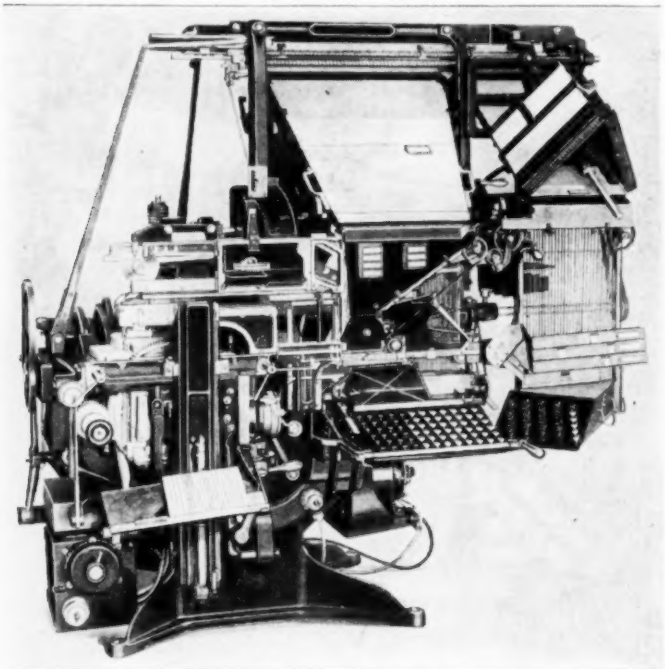
TIE HUTS USED TO HOUSE RAILROAD LABOR

For many years, unsightly and insanitary box cars have been used along the railroads for the housing of section labor. Recently, a change in the housing system was noted along the Southern Pacific Railroad. Instead of the former dilapidated box cars, clean little huts of ties, bound with cement, were seen. These have a much neater appearance and also provide a use for ties which are no longer fit for roadbed service.

Huts Built of Ties Bound with Cement are Now Used Instead of Dilapidated Box Cars for Housing Laborers along the Southern Pacific Railway

NEW TYPESETTING MACHINE CASTS SEVEN-INCH SLUG

The completion of a linotype machine which will cast any length of line up to 42 ems, or 7 in., in a single slug, has been announced. This machine is similar to other line-casting machines in appearance. It is supplied with six magazines which can be quickly changed from the operator's seat and handled easily by one man. The operation is so simple that a high rate of production can be secured. Type sizes from 5-point to 48-point face are available. The machine is especially designed for advertising and display work,



This Line-Casting Composing Machine Casts a 42-Em, or Seven-Inch, Slug in One Piece. Though Designed for Advertising and Display Work, It will Set Any Material, 5 to 48-Point Matrices Being Available

but, because of its wide range of adaptability it is equally efficient in performing any of the more ordinary forms of composition.

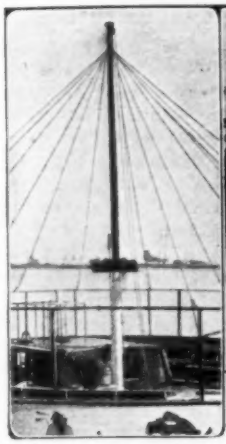
SURPLUS NIGHTTIME POWER STORED FOR DAYTIME USE

With the object of storing surplus power available during the night for use during the day, a novel means was recently adopted at Vivarone, Italy. At a location where there are two lakes, with a difference in elevation of 483 ft., a plant was erected on the level of the lower lake and equipped with a set of motor-driven high-pressure pumps to be used, during the night, to pump the water to the higher lake. The water thus stored was discharged, during the day, to the lower lake through water wheels driving generators. The efficiency of the system was about 40 per cent.

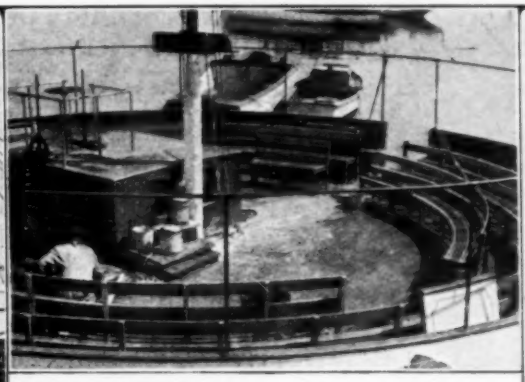
PLANTING OF TREES MAKES WASTE LAND PROFITABLE

For many years New York State has sold, through its forest department, trees for reforesting purposes, and now it is preparing to give away trees for planting on waste lands. It is hoped that the idea will become national, for there are millions of waste acres in the United States that are good for nothing else. In many cases even part of the farmer's land now being used for other crops would prove more profitable if planted with trees of any soft-wood, rapid-growing species, such for instance as the Carolina poplar. In a few years after planting, this tree reaches a size that can be used industrially. In 10 years the stand is ready for thinning, or it may even be cleared away and replanted. At that age the trunks can be used for making pulp, excelsior, or even for soft-wood lumber. Three men, properly equipped and working as a team, can plant an acre in five hours, which means from 1,000 to 1,200 trees. At average cost this amounts to less than $20 an acre, and in 10 years these 1,000 or 1,200 trees are worth $2 or more each. It is estimated that the trees obtained by thinning would yield from $500 to $1,000 per acre, being $50 to $100 per acre per year from the time of planting. Within three or four years the poplars give cover that is of special value in open and dry regions, attracting and retaining moisture during the summer, and in winter gathering the snow and holding it around their trunks, which is of great advantage to the soil when the thaw comes.

"JAZZ BOAT" IS MERRY-GO-ROUND ON WATER



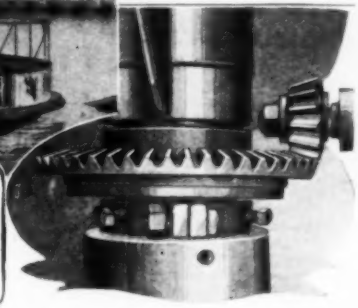
Above: The Mast of the Boat Is Also the Smokestack. Below: The Bridge with Engine Control at the Right; in the Center, the Propeller Housing Control, and at the **Left**, the Rudder Control



The Interior of the "Jazz Boat," Showing the Seating Arrangement and the Location of the Bridge, from Which the Boat is Controlled, the Cabin, and the Engine Room

Above: The Diagram Shows the Positions of the Rudder and Propeller When Set to Move Forward and When Set to "Jazz." Below: Interior of the Revolving Propeller Housing, Showing the Control Gears

The Tublike "Jazz Boat" as It Appears Floating on the Water at Its Dock: This Water Merry-Go-Round Has a Capacity of 300 Passengers



The first "jazz boat" has made its appearance. The jazz boat might be termed a merry-go-round on water, although it is capable of creating sensations that its land prototype could never duplicate.

The device is a round tublike affair, 40 ft. in diameter and 3 ft. in depth. The bottom is flat. At one point on the circumference, arbitrarily selected as the stern of the ship, is mounted a 30-in. propeller. The entire propeller housing and its gear-driving apparatus are mounted in such a manner that they can be revolved as a unit. A rudder is mounted at the bow of the ship. A gasoline engine provides motive power. The central mast is also the smokestack.

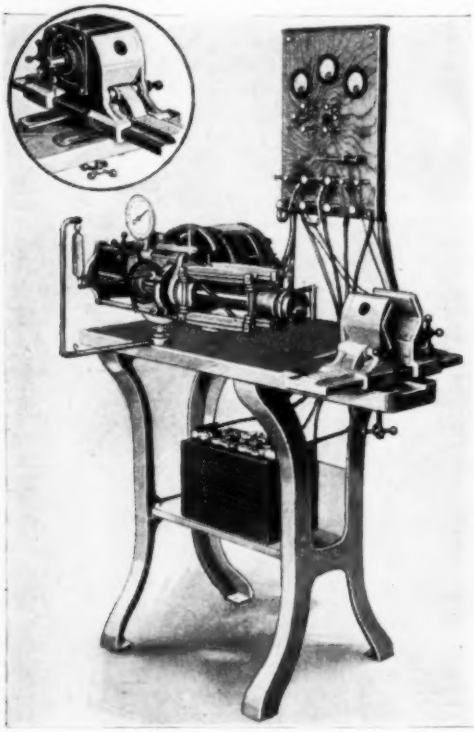
The operation of the boat is as follows: When a load of passengers has boarded it, the boat casts off from the wharf and proceeds a little way out into the water. While it is still moving forward, the propeller housing is turned so that it is driving the boat from one side. At the same time, the rudder on the opposite side of the boat is set parallel with the propeller shaft. The effect would be to drive the boat in circles, but as the forward momentum has not been lost, the boat instead goes round in a coillike path, or, in the language of the builders, it "jazzes."

Various manipulations of the revolving propeller provide various movements and sensations, and the controls are arranged for very rapid changes. Consequently, the boat rolls like a tub in a most erratic fashion, first one way and then another.

The passenger capacity of the odd affair is 300. A 20-minute trip is given the passengers; then the boat returns to the wharf for another load. It is becoming one of the popular attractions at the amusement parks.

TEST BENCH FOR AUTOMOTIVE ELECTRICAL DEVICES

A test bench for holding, driving, and testing any kind of electrical appliance used in the automotive industry has been placed on the market by a Kansas City, Mo., manufacturer. An outstanding feature of the machine is the four-bar parallel-bracket arrangement which holds the driving head and chuck parallel in relation to the holding vise at all positions through a vertical radius of 6 in. and a horizontal radius of 12 in. The holding vise can be moved forward or backward, and when it holds an appliance being tested, it can be brought forward to the chuck, in which the shaft of the appliance can be clamped instantly. The driving head has an absolutely uniform speed at all angles of operation. The holding vise has features which enable the operator to clamp, chuck, and drive any magneto, generator, or starting motor in less than one minute. The machine is equipped with a 1-hp. motor, and all the instruments necessary for testing any kind of automotive appliance or accessory.



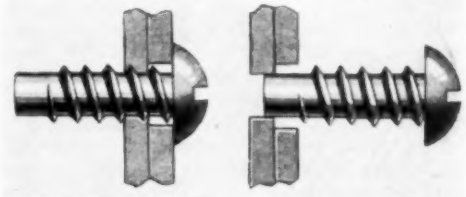
Test Bench for Speedy and Accurate Testing of Automotive Electrical Appliances: Its Four-Bar Parallel-Bracket Arrangement Is Adjustable, Moving Driving Head and Chuck as Required

MOTOR-CAR POSTAL SERVICE IN FINNISH LAPLAND

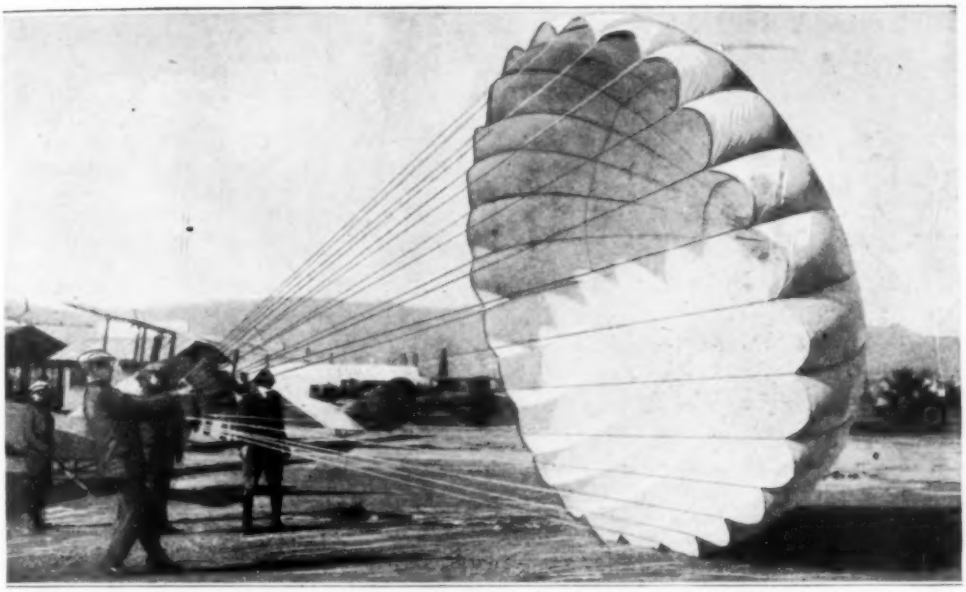
Regular motor-car postal service would seem to be unsuitable to such an arctic climate as Finnish Lapland, but such a service is made possible by the use of continuous-tread tractor drive in the winter time. A regular service between Rovaniemi and Sodankyla has been established for some time, and has proved to be generally satisfactory, so much so, in fact, that the postal administration has decided to inaugurate other lines. The cost of the service is reduced by carrying paying passengers and freight in the motor cars as well as mail. Indeed, on the basis of what has already been accomplished, it is calculated that a tractor capable of hauling 10 tons, and loaded in two trailer sleighs with 4½ tons of goods and five passengers, will make a profit each trip of about 2,000 Finnish marks.

SCREW THAT CAN CUT THREAD OBVIATES NEED OF TAPPING

A machine screw that cuts its own thread in a drilled hole in any soft white or yellow metal, and even, it is said, in cast iron, thus eliminating any necessity for tapping, is now on the market. The thread of the screw is so shaped that, after special hardening treatment, it will tap the metal it is driven into without the application of any unusual force to the screwdriver. In joining two pieces of metal, the outside piece is drilled with a hole large enough to clear the thread, and the piece that is to be tapped is drilled with a hole of the same diameter as the stem of the screw, which is extended beyond the thread to act as a pilot. Thus the two pieces of metal are held together by the pressure of the screw head on the outer piece. It is believed that these screws will be found very useful in the assembly of die castings, and also in the manufacture of metal furniture, stoves, and kindred metal products.



Screw That Cuts Its Own Thread in Soft Metals, Shown, at Right, Entering Drilled Holes in Two Plates



After Making a Parachute Jump from an Airplane, the Airman is Inflating His Parachute by Utilizing the Draft from the Propeller of Another Airplane on the Ground. The Parachute is Thus Held Open While He Tests the Lines, Straightens Out the "Chute," and Folds It Preparatory for Further Use

DRAFT FROM AIR PROPELLER TESTS PARACHUTES

When a parachute is collapsed on the ground it is almost impossible to straighten the lines for the purpose of testing the adjustment for length, and ascertain that they are not tangled, all of which must be seen to before the parachute jumper risks his life in a spectacular leap. Usually the work of rigging and otherwise testing and adjusting a parachute is done by tying it up by the vent to an overhead wire, or other high support, and then wiring up the edges of the "chute," spreading it like an umbrella to enable the operator to work upon it. This method, however, is tedious and more or less unsatisfactory.

At a western aviation field a well-known professional "wing walker" and parachute jumper recently developed a far more satisfactory method of adjusting his "chute" than anything heretofore tried out. He had just made a jump from an airplane, and after landing safely on the aviation field wanted to test his parachute and fold it preparatory to further use. There was no suitable place for tying up the chute, but seeing several airplanes standing about the field, he got an idea. The parachute was stretched on the ground behind the tail of a plane, and after the wheels had been blocked, the motor was started. Being pulled up into the draft from the airplane's propeller by its lines, the parachute immediately popped open and was kept so, while the lines were carefully adjusted and tested.

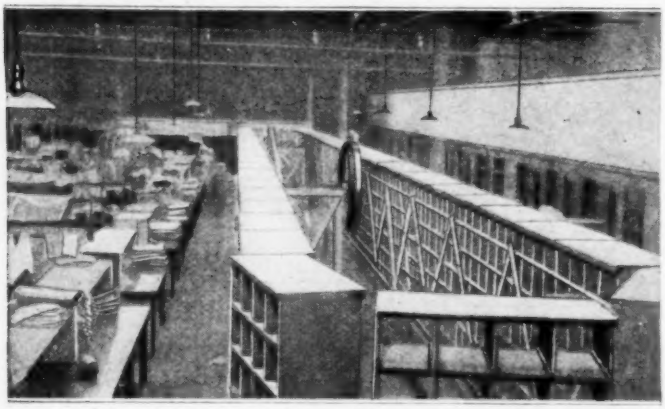
As the full blast of the propeller would have taken the parachute "across lots," with men and all dangling on the ends of the lines, the engine was throttled down to a speed that created just enough breeze to keep the canvas well inflated and pulling steadily.

The use of the airplane-furnished breeze has saved hours of time and much hard work on several later occasions.

AUSTRIANS BEAT COKE SHORTAGE WITH OIL

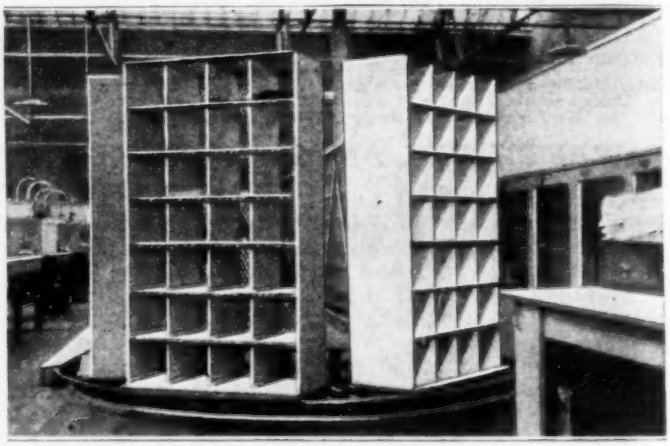
Because of a coke shortage due to war conditions, Austria was obliged to turn to some other fuel for heating cupola furnaces. Oil seemed to be the only promising medium, and its trial as an alternate produced some astonishing but desirable results. The experimental furnaces were equipped with two burners and a necessary complement of air pipes. No other alterations were made. The tests disclosed the fact that the coke charge, when oil was used, was reduced by 11 lb. to each 200-lb. iron charge. The oil required was a little over 2 lb., and the melt was accomplished in from one-third to one-half the usual time.

LAUNDRY SORTING BOXES MOVE IN ENDLESS TRAIN

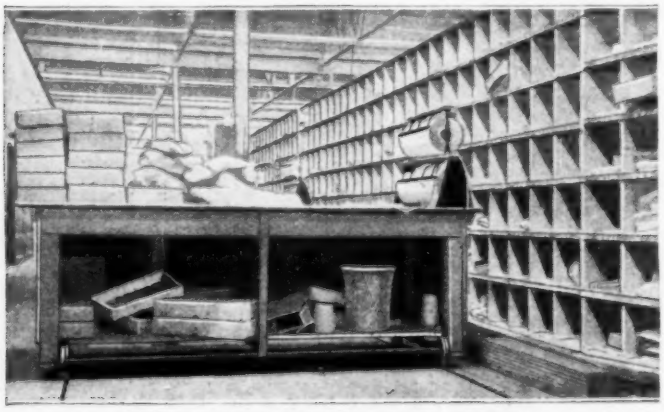


Completed Laundry is Placed on the Tables at the Left, from Which It is Sorted into the Boxes of the Endless Train. When Each Unit is Filled, the Train is Moved Along by the Motor and Belt System in the Center

Conveyor systems are serving their purpose in almost every industry and business, but the combination of train and endless chain is something new as it has been applied to the sorting and packing of collars, shirts, towels, etc., in a modern laundry. The sorting boxes are arranged in sections containing 28 boxes each, the sections being fastened to each other at the bottom to make a continuous train as they pass slowly before the sorters and packers. The train is driven by a motor in the aisle between the two rows of sections, and there is a special track at the ends to keep the sections on the roller conveyor beneath. The train can be stopped by means of push-button controllers placed at various points. The ironed laundry is delivered directly from the ironing machines to the sorting tables, which are arranged in a line so that the lighter and finer pieces are placed last in the compartment to avoid crushing. The train is stopped in the operation of sorting the laundry consecutively into the boxes at the several tables, and as this is done, the packers and checkers on the opposite side of the train remove the contents of each box.



The Sorting Boxes, Making a Turn after being Emptied at the Checking and Wrapping Tables: The Numbers on the Boxes are Changed and They are Refilled with New Lots of Laundry



One of the Checking and Wrapping Tables: These Tables Run on Tracks along the Sorting Boxes. When the Bundles Are Ready, They are Removed to the Drivers' Loading Rooms

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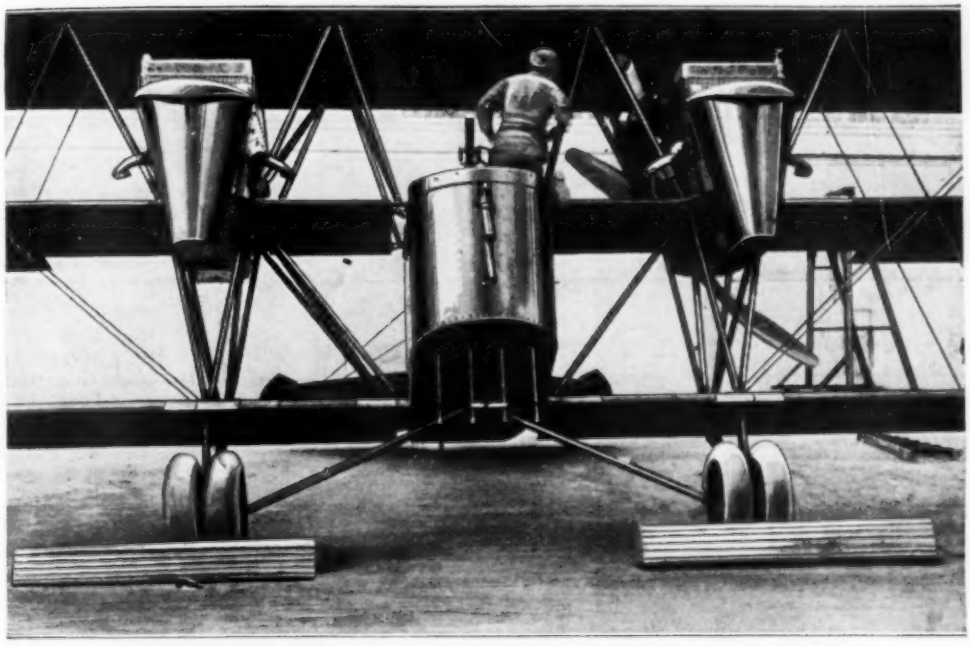
¶ The superdreadnaught "Washington," sister ship of the "Maryland" and "Colorado," the largest battleships of the United States Navy, was launched on September 1. It is designed for a speed of 24 miles an hour.

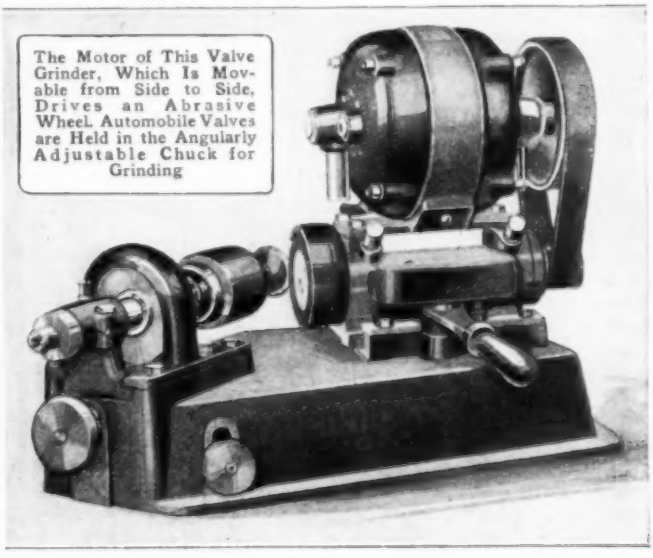


ARMORED AIRPLANE—UNITED STATES ARMY'S LATEST WAR DEVICE

THE completion of the first armored airplane, at McCook Field, Dayton, Ohio, has been announced by the United States Army Air Service. The fuselage, cockpit, and motors are covered with thick steel plates. The wings are cloth-covered and have a span of 85 ft. Two Liberty motors furnish the power. Eight Lewis machine guns are so mounted on the frame that they can be fired at any angle. The plane also carries a small cannon and 10 aerial bombs. It will be manned by a crew of three.

AUTO VALVES ACCURATELY GROUND BY NEW DEVICE

Valves are the heart of the auto engine. They are the intake of the power and the outlet of the waste. The engine has leakage of the heart if its valves are not faced to assure positive contact all the way around, and to keep the valve faces in proper condition, an improved grinder has been developed. The abrasive wheel of the device is propelled by a motor located on a movable head. By manipulating a lever, this head may be worked back and forth. The valve is held in a chuck which has an angle adjustment of from 25° to 65°. After this has been set to the desired angle, the grinding wheel is brought against the valve by means of the lever, and the power turned on until the bevel is finished.



The Motor of This Valve Grinder, Which Is Movable from Side to Side, Drives an Abrasive Wheel. Automobile Valves are Held in the Angularly Adjustable Chuck for Grinding

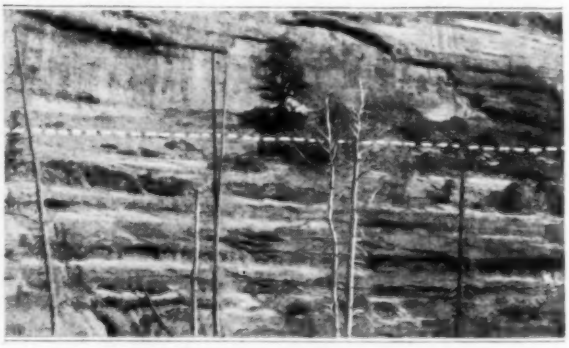
SCENIC MOUNTAIN ROAD BLASTED FROM CLIFFS

By FREDERIC KINNEY

ENGINEERS and contractors have begun work on what is regarded as an extraordinary venture even in these days of out-of-the-ordinary engineering feats. For many years residents of that section of Utah have desired the opening to travel of the stretch of Cedar Cañon route between Cedar City and Navajo Lake, in the heart of some of the most remarkable scenic beauties in the Beehive State, which have heretofore been inaccessible to motor traffic.

Steam Shovel at Work Cutting a Mile of Roadway along the Face of the Towering Cliff at Long Valley: Explosives Supplemented the Work of the Shovel

The Mountain of Shale in Cedar Cañon Which will be Used for Surfacing the Roadbed between Cedar City and Navajo Lake: The New Road will Cross This Shale Bed



At the Cliff the Roadway will Be 20 Feet Wide. Traffic will be Protected from the 40-Foot Drop Below by a Concrete Wall along the Outer Edge of the Roadway

Exhaustive surveys resulted in decision that the building of a roadway 28 miles in length, traversing Cedar Cañon, was possible, provided a one-mile stretch could be dug out of the towering cliffs in the cañon region known as Long Valley. Engineers declared that this could be done, using explosives where the rocky formation offered most difficulty, and powerful steam shovels where conditions were more amenable to modern engineering methods.

Surveying parties going over the proposed route discovered extensive beds of shale, which will be utilized in surfacing the entire length of the new roadway, which will follow the side of Coal Creek to the summit of the Pahvant Mountains, at an elevation of 10,000 ft., whence it will descend by easy grades as the approach to Navajo Lake is reached.

The commissioners of the region, assisted by the state department of highways, is bearing the cost of construction, estimated at $200,000. The expense will be materially lessened because of the availability of the shale deposits. This shale is readily crushed and because of its oily character produces a practically dustless roadbed even under extreme traffic use. Superintending the construction work is a member of the Federal Bureau of Public Roads, since the government has allotted a portion of the cost in its program of roadbuilding aid.

The eight-mile section of the road, one mile of which is to be literally hewn from the towering cliffs of Long Valley, is the bit of enterprise exciting the attention of intermountain-country engineers. Surveyors found that this section presented an obstacle to the proposed road unless it was engaged with the weapons of dynamite and steam shovels. It was decided to begin at the point of approach where

the cliff offered opportunity to bite away at the rock, cutting a path before the excavating crews. The natural formation of the cliffs is a series of ledges. The ledge nearest the level of the connecting and accessible approaches was selected for the attack of the explosives and gnawing steam shovel. Fortunately, the formation yields readily, and substantial progress is being made on this particularly difficult stretch of roadway.

The roadway at the Long Valley point of the project will be 20 ft. in width. Concrete walls will be constructed at the outer edge, affording ample protection to travelers. The solid character of the cliff formation insures the roadway against the menace of landslides. Nevertheless, it is unlikely that the road will be used during the winter months, owing to the heavy snowfalls and the consequent danger of accident from this source.

The new route will shorten the distance between Cedar City and Navajo Lake by nearly 30 miles, and will open to tourist travel one of the most interesting of Utah's scenic wonderlands. An effort is being made to complete the project this year.

A number of Utah roads have been surfaced with shale deposits, still others being paved with deposits taken from the shores of Great Salt Lake. The shale mountain discovered by engineers surveying the Cedar City-Navajo Lake route contains material enough, it is estimated, to surface twice the mileage embraced in the projected roadway. The shale will be gathered by steam shovels, crushed, and hauled to dumping places along the road.

WIRELESS TELEGRAPHY SERVES AS AUTOMOBILE SAFEGUARD

There is no limit to the manifold possibilities of wireless telegraphy. It was the means recently of saving a doctor from the probable loss of his automobile. He had driven to Boston with his wife to see her off by a steamboat bound for New York. He did his seeing off too effectively, and he saw himself off as well as his wife, for the gangplank had been raised some time before he tried to disembark. There was no choice but to continue the voyage, and in order to preserve his abandoned automobile, he had the ship's wireless operator send a message to the Boston police. The message was picked up, on his apparatus, by a youthful wireless amateur, and he notified the police, who found the automobile, and removed it to a safer place.

¶The present daily output of the famous Krupp works at Essen, Germany, consists of one locomotive and eight freight cars, besides numerous lines of adding machines, surgical instruments, motion-picture projectors, Diesel engines, paper and textile manufacturing machinery, pneumatic tools, and other similar devices.

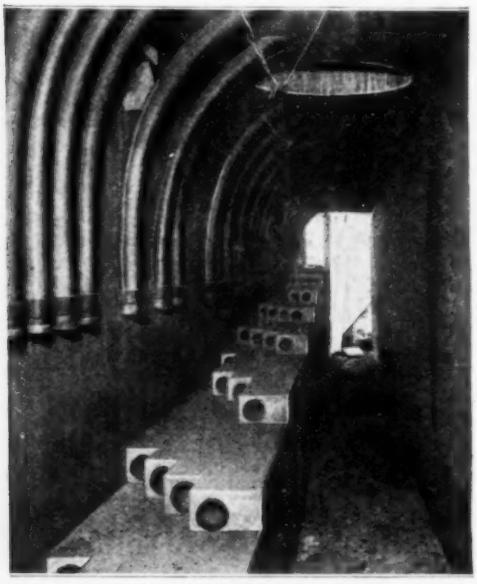
STOCK AND GAME PROTECTED FROM PREDATORY ANIMALS

An organized effort to prevent the ravages of animals which prey on live stock and game, such as deer, etc., is resulting in the capture of many of the culprit beasts. The government maintains a patrol of men in the mountainous regions, whose business it is to poison, shoot, and trap the marauders. One field foreman near Montrose, Colo., has already bagged two mountain lions, one of which measured nearly 8 ft. from head to tail. Both of the tawny thieves had been indicted with the disposal of thousands of dollars' worth of live stock in the vicinity.

One of Two Mountain Lions Killed near Montrose, Colorado, by a Government Patrolman: The Lion had Destroyed Much Live Stock

TUNNEL BUILT ABOVE GROUND AND PUSHED INTO PLACE

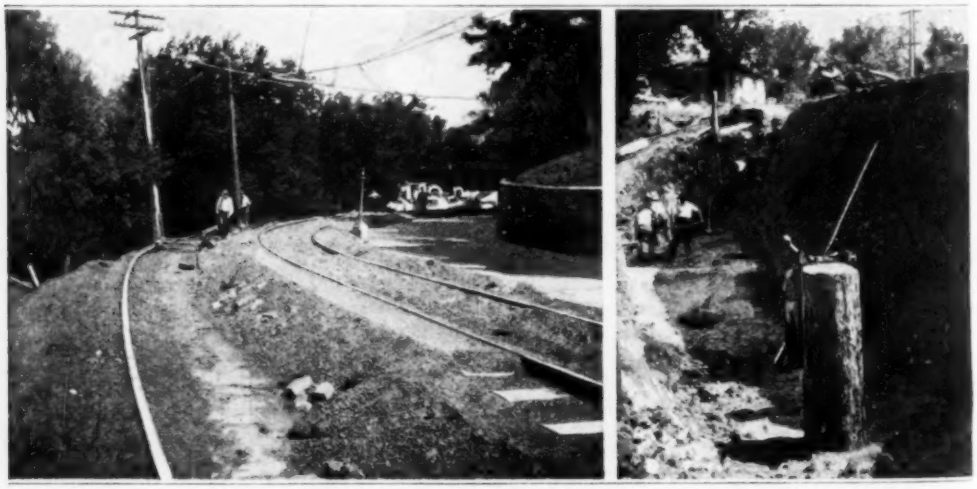
An unusual method of tunnel construction is being employed in building an electric-light plant at Pueblo, Colo. Instead of excavating and then laying the concrete forms underground, the forms are built outside in sections and pushed into place by means of eight 50-ton ball-ratchet jacks, as the dirt ahead is excavated. This tunnel had to pass under the Santa Fe and Missouri Pacific Railroad tracks. The heavy traffic prevented ordinary tunneling methods because of the danger of cave-ins. Excavating is carried forward 5 ft. at a time and three steel rails are laid in 5-ft. sections. The 20-ft. concrete tunnel sections are jacked forward, one at a time, upon these rails. A ½-in. steel plate forms a protecting hood, at the forward end of the first section, for the space in which excavating is being done. Similar plates at the junctures of the sections protect the intervening space when each section is moved forward. The work is progressing at the rate of 53 in. a day. At the time of the Pueblo flood, the tunnel was completely filled by water and mud, but was not damaged in any way.



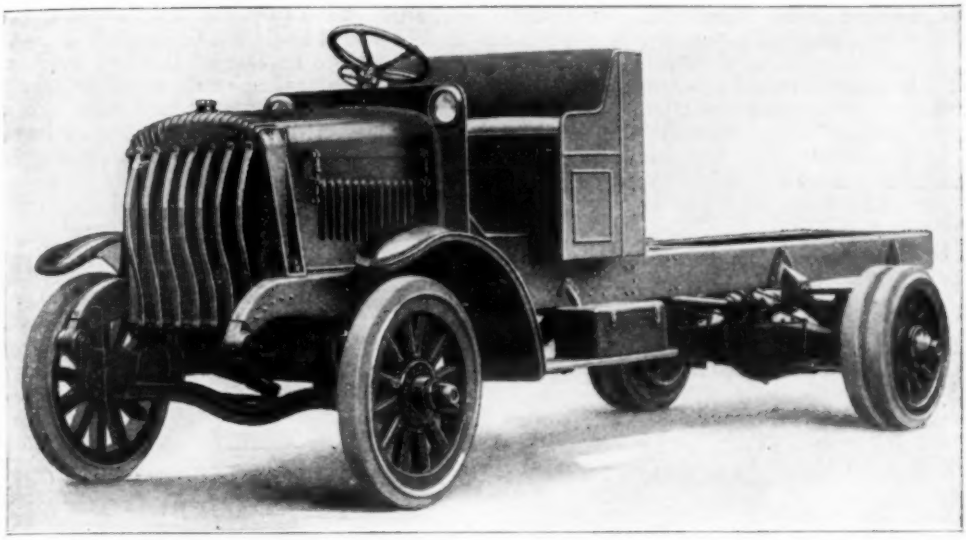
The Interior of the Tunnel Which is being Built above Ground: The Work is Completed as the Tunnel Advances through the Excavation

KEEPING A CAR LINE FROM SLIDING DOWNHILL

On what is known as the "South Bluff" in Ottawa, Ill., a street is built close to the edge of the bluff. On the downhill side of the street is an interurban car track. Because of heavy traffic the hillside began to give way, endangering the cars, and it was decided to build a 25-ft. retaining wall. Cars could not be operated safely during the construction of the wall, and the company could not afford to suspend operation at that point until it was completed. Permission was secured from the city officials to move the entire track over 15 ft. onto the pavement, and the cars continued to run on schedule.



At the Left: The Interurban Tracks as They Appear Since being Moved onto the Roadway, Out of the Way of Construction. Beside Them Are the Old Tracks along the Edge of the Bluff. At the Right: The Excavation for the Retaining Wall Which is to Keep the Road from Sliding Downhill



This Motor Truck is Propelled by Steam. Burner Troubles Which have Heretofore Bothered Steam-Truck Owners, have been Remedied. The Trucks are Made in 3½ and 5-Ton Capacities

AUTO TRUCK IS PROPELLED BY STEAM

Although steam has been used for the propulsion of pleasure automobiles with considerable success, it has not been widely used as a power for propelling heavy trucks. Fuel burners have been largely responsible for the slow progress up to the present time, as they easily get out of order. A new truck is now ready for the market which has a greatly improved burner. The fuel—kerosene, distillate, or crude oil—is delivered to the burner under pressure. It strikes the orifice of the burner with such force that it is sufficiently broken up for combustion without the introduction of additional air. The fire box, which is cylindrical, receives the open burner flame and whirls it. Complete combustion is brought about in this manner, it is claimed, so that the heat, not the flame, strikes the boiler tubes above. The trucks are of very heavy construction throughout, and are built in 3½ and 5-ton capacities.

RANGE-FINDING RIFLE SIGHT USED WITH BOTH EYES OPEN

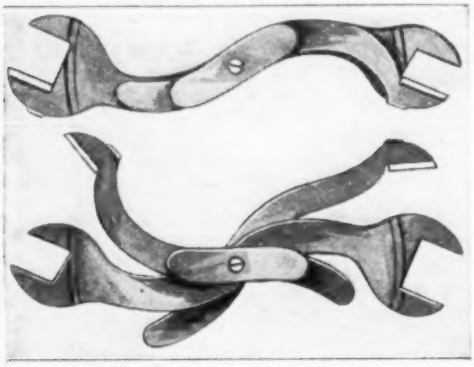
Not to have to shut one eye when aiming, and, furthermore, to get better results with both eyes open, will be a welcome innovation to the rifleman at any rate, if not to the shotgun sportsman who usually aims with both eyes open anyway. A new gunsight which has been devised with this object in view, is based on a principle which is very easily tested. Take two wires, or flat, thin bars—at a pinch even two common lead pencils will do it roughly—and hold them upright in front of the face in such a manner that the lower ends are separated about four or five inches, and the upper ends slope toward each other, as in an isosceles triangle, without meeting at the top. Then focus both eyes on some distant object, and it will be seen that the two sloping wires will appear to take the form of the letter

Above: New Range-Finding Gun and Rifle Sight. Lower Right: Sight in Position before the Eyes, with the Result Shown in Upper Right, Where the Sloping Sides Appear to Form an "X"

"X." If the point of intersection of this X be lined up with the object that the eyes are focused on, the aim—in the case of a firearm—would be correct. The new sight, based on this principle, is made so as to present to the eyes the thin edge of a hard-steel bar, bent into the shape of an isosceles triangle with its upper point cut off, and beaded to prevent light reflection. This is placed horizontally on, and at right angles to, the muzzle of the gun or rifle, and can be attached or detached instantly without interfering with the old sights. When used with a rifle, one of its advantages is that the back sight is no longer needed.

S-WRENCH CAN BE ADJUSTED FOR VARIOUS-SIZED NUTS

A recently invented S-wrench can be adjusted to fit nuts of eight different sizes.

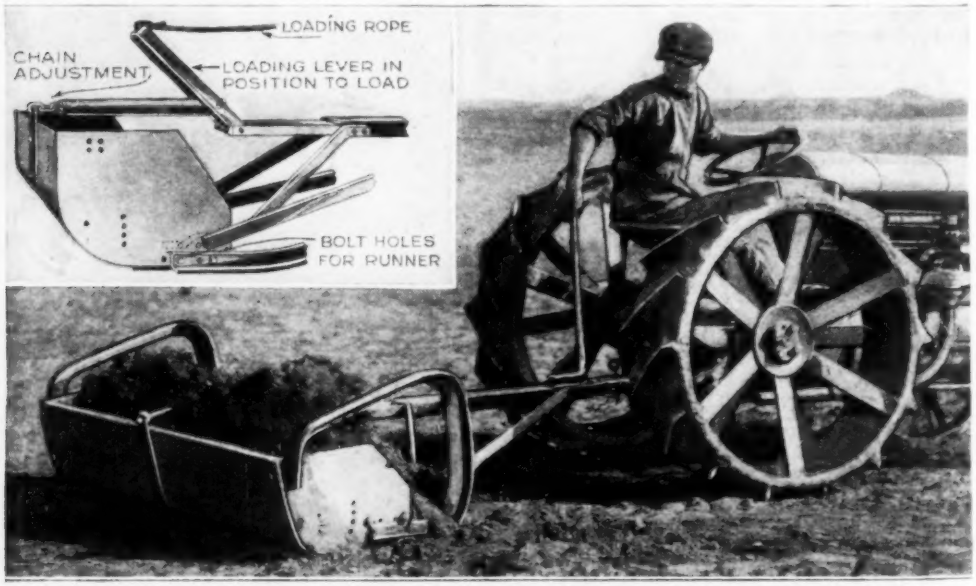


Adjustable S-Wrench Shown Closed and Open: The Auxiliary Jaw for Each End, Seen Out of Position Below, is Set to Fit Nut as Seen Above

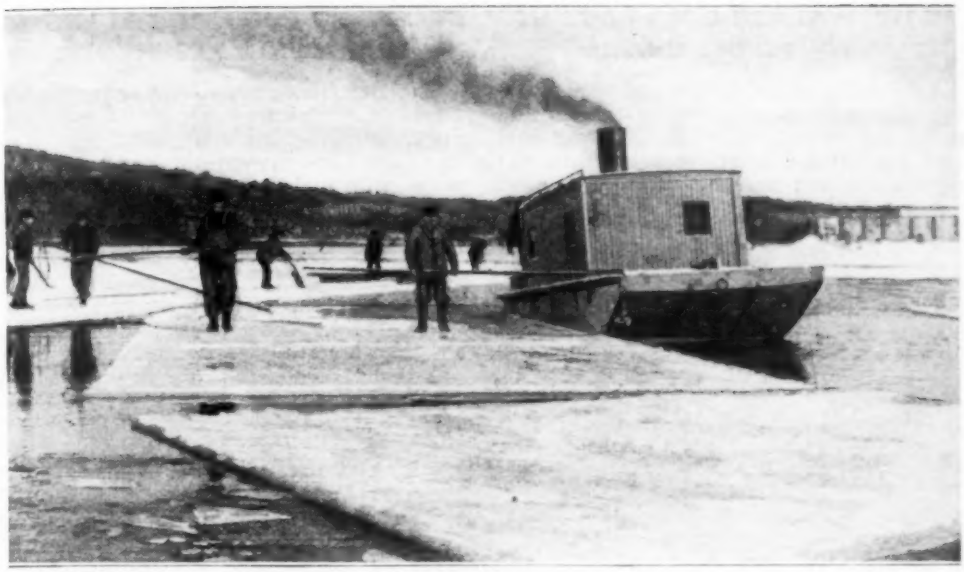
Besides the two jaws of an ordinary S-wrench it has an auxiliary jaw for each end, pivoted at its center. These can be set to fit nuts smaller than those which the stationary jaws fit. They are retained in this position by two reinforcing bars, or springs, connected to the central pivot. Both the main wrench and the auxiliary jaws are made of tool steel, hardened and tempered.

HITCH FOR SCRAPER PERMITS ONE-MAN OPERATION

Two men have always been required to operate the ordinary scraper, one to drive and the other to walk behind and handle the scraper. A new hitch now makes one-man operation possible. This not only saves labor but also time, by the increased speed of tractor operation. The hitch is manipulated from the seat by pulling a rope, or lever. This depresses the cutting edge so that it digs into the ground. It can also be dumped in the same way. The new hitch has now been adapted to the rock gatherer and the cultivator.



Above Is a Scraper Drawn by a Tractor and Equipped with a Hitch Operated by a Hand Lever. In the Insert the Construction of the Hitch is Shown in Detail



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This Curious-Looking Boat Pushes 14-Ton Cakes of Ice to the Ice House, on a Stream near Brookline, New Hampshire. In Preventing Overnight Freeze-Ups by Running Back and Forth, It Does Work Which Formerly Required Six Men

CURIOUS BOAT KEEPS ICE CHANNEL CLEAR

A grotesque-looking steamboat, in use on a stream near Brookline, N. H., serves the double purpose of pushing 14-ton cakes of ice to the ice house and keeping the channel clear of overnight freeze-ups. Formerly six men were necessary to do the work of keeping the ice off the channel during cold winter nights, but were dispensed with by the use of the queer boat which plies back and forth continuously over the freezing stream. It is scowlike in design and of great value during the ice harvests.

INSTRUMENT FOR CALCULATING BLANKING PRESSURES

In all kinds of stamping work done with power presses it is necessary to know the pressure required to do the work. This can now be ascertained, without doing any figuring, by the use of a newly patented instrument in the form of a blanking-pressure calculator. On this can be ascertained the pressure required for any circular blank up to 20-in. diameter, and for any square or irregular-shaped blanks having perimeters up to 60 in. long. It is composed of two disks, the larger one being stationary, and the smaller one, mounted centrally upon it, movable. The graduations on the bottom disk, marked A, are for diameters and perimeter lengths in inches, which border a series of graduations, marked B, on the outside edge of the upper disk giving the thick-

Blanking-Pressure Calculator in Which the Upper Disk Rotates: When the Graduations D are Set to A, It Gives Readings of the Blanking Pressures in the Slot Above

ness of blanks. B is set to A, and then in a circular slot on the other side of the upper disk, by means of other graduations on the bottom disk, the pressure in tons can be read on the outside edge of the slot for diameters, and on the inside for lengths, and also for different materials, such as aluminum, brass, iron, and steel.

WIRE WALKER GOES BACK IN TRIP ACROSS CHASM

The thrills of tight-rope and wire walking generally go with the breathless and expectant crowd who stand about and look on, but the situation was a little the reverse for one wire walker who decided to cross Chasm Cañon, Eldorado, Colo., by way of the sky line. The thrill evidently became too great for him, this time, and he returned to the starting point before he had passed the middle of the 586-ft. cable. Several rests were necessary in going as far as he did, for gymnastic stunts which he had performed on the wire during the early part of his attempt, had wearied him. It is probable, too, that a possible 682-ft. drop to earth had something to do with the failure. To be able to turn and retrace his steps to the start, however, required not only considerable self-command and nerve, but no mean degree of skill.

On a Tight Rope, 682 Feet above the Ground over Chasm Cañon, Eldorado, Colorado: The Walker, Unnerved by the Trip, Turned Back Before He had Gone Halfway Across

BRAZIL TO CONSTRUCT LARGEST IRRIGATION RESERVOIRS

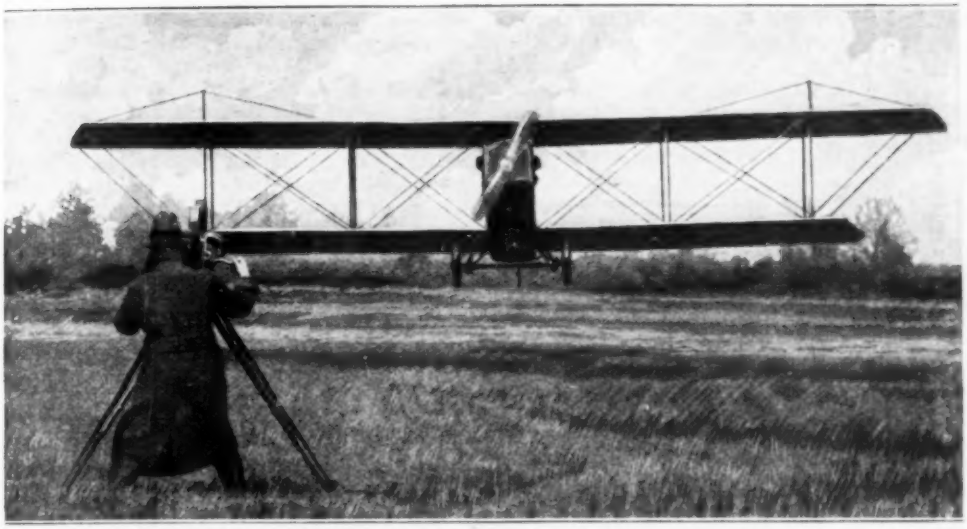
The Brazilian government has employed a firm of American engineers to supervise the engineering and construction work of an enormous irrigation project. The work will include the building of five large dams, requiring nearly 1,000,000 cu. yd. of concrete, to create storage reservoirs which will be the largest in the world. Certain parts of Brazil are semi-arid. The average rainfall of about 30 in. would be sufficient for crops if properly distributed, but there is a dry season from May to December and a rainy season from January to June. If the precipitation falls in heavy rains the soil is thoroughly saturated, but at times it comes in thin showers which, under the tropical sun, are quickly evaporated and do no good. Severe droughts and famine result. It is to remedy this condition that the reclamation will be undertaken.

CHINA ADOPTS AIRPLANE MAIL SERVICE

Airplane mail service was introduced in China on July 1, by a flight from Peking to Tsinanfu and return, a trip of 474 miles. The plane was an English commercial type, capable of carrying 12 passengers in the cabin. Several representatives of the press and the government made the initial trip. Regular tri-weekly postal and passenger service between these points is being maintained, and the service has been extended to Shanghai, with stops at Tsinan and Nanking. At present foreign pilots are employed, but the work will be taken over by a corps of Chinese students who are now undergoing a special course of training for the purpose.

NEW MUSIC RELIEVES STRAIN ON MUSICIANS' EYES

Music printed on dark green paper, with the notes and staff in white, is being used to reduce eye strain. It is particularly designed for use in theaters where bad lighting causes unusual strain on the musicians' eyes. In semidarkness the notes seem to stand out in relief.

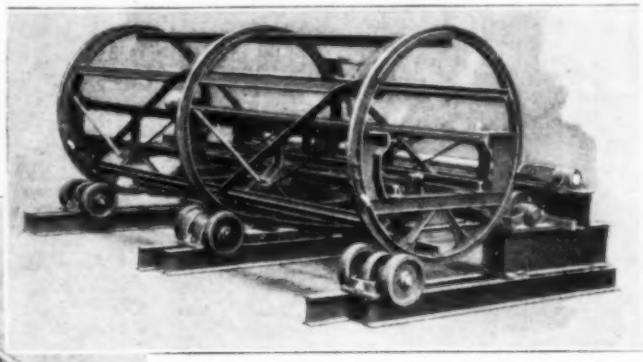


AIRPLANE DIVES WITHIN FEW INCHES OF MOVIE CAMERA

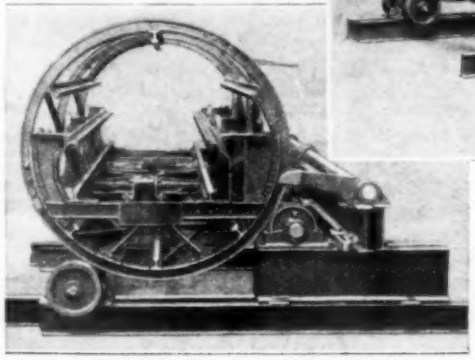
IN order to produce a motion-picture scene that would cause the members of an audience instinctively to duck their heads, a movie-camera man and an army airman conspired together to discover just how close an airplane could come to a camera without actually hitting it. After a few practice turns, the pilot dived until he was on a level with the camera and then headed straight toward it. When he had approached within five feet he zoomed upward, just in time barely to miss the top of the camera with the lower wing. Meanwhile the camera man was crouching under the tripod. A fraction of a second before he had ducked under the camera. But the turning mechanism had been previously well oiled and continued revolving, so that the resulting film was all that could be desired.

AUTOMATIC TIPPLE DUMPS CARS BY GRAVITY

Hitherto, all rotating tipples used for dumping mine cars have been dependent upon some outside source of power for their operation. A new car tipple does not require any power for its operation, except that furnished by the car itself. The tipple, supported on rollers, is in the form of a number of rings braced together longitudinally and large enough in diameter to accommodate a track with one or more mine cars upon it. The center of gravity of the cars is eccentric to the center of rotation of the rings, so that their weight tends to turn the tipple through an arc of 135°, and through this rotation sets in motion a series of flywheels supported on the roller shafts, their momentum keeping the roll-



Car Tipple That Dumps Cars Automatically, Requiring No Outside Source of Power: The One Shown Is Large Enough to Receive Two Loaded Mine Cars Simultaneously

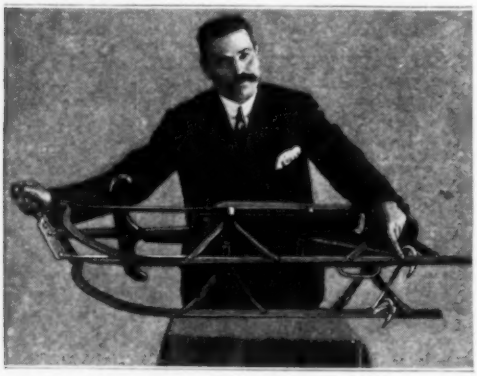


Side View of Car Tipple: When the Lever at the Right is Released, the Tipple, Actuated by the Weight of the Car, Rotates, Dumping the Load, Then Automatically Returns to Its Upright Position

ers in motion and helping in the rotation of the tipple. Thus the car acts like the weight of a pendulum, and at the end of its swing, if left alone, would return not quite to its original position. Instead of being allowed to do this, the tipple ring engages with a specially designed spring and wedge, which stops its forward motion, and then starts it back to its original position, where it is automatically caught and held by a latch lever, which furnishes the means of control of the tipple.

SLED BRAKE MAKES COASTING SAFE FOR CHILDREN

Much of the danger to children when coasting with sleds is done away with by a newly developed brake. The brake



A Sled with the Safety Device Attached: The Sharp Hooks Operated by the Lever at the Front Form a Most Effective Brake

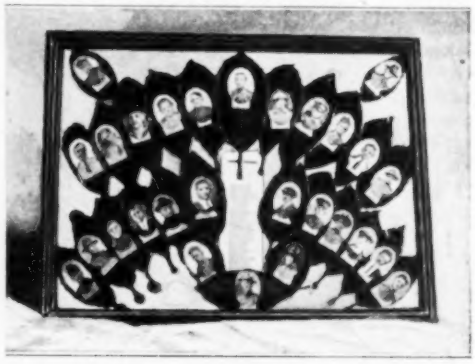
consists of two hooks pivotally mounted on the runners of the sled and linked to a bar hung on brackets beneath the seat. The bar extends to the front, where it is attached to a lever. The upper end of the lever is provided with a handle which, when pulled, lowers the hooks and checks the speed of the sled. A spring pulls the brakes up when the lever is released.

ONE MILE OF PERFECT ROADWAY AS PART OF IDEAL HIGHWAY

The best mile of road in the world, to be constructed at some point on the great transcontinental highway of the future, is being planned by the Lincoln Highway Association. As an object lesson this perfect mile will stimulate interest in highway improvement, and especially in the promotion of an ocean-to-ocean roadway, embodying the highest ideals of modern American highway construction. After an immense amount of consultation and collaboration among the foremost highway engineers, it has been decided to construct this ideal mile on the Lincoln Way, so located as to be of easy access from all parts of the country, and where it will carry a representative and diversified traffic. The location tentatively selected is between Dyer and Schererville in Lake County, Indiana. The general specifications are: 40 ft. of reinforced-concrete paving, 10 in. thick, laid in the center of a 100-ft. right of way, and flanked with 5-ft. shoulders. The 25 ft. of right of way on either side will be beautified in boulevard fashion, having on one side a walk for pedestrians, and being brilliantly and artistically illuminated throughout.

BEAUTIFUL MEMORIAL FOR BOYS WHO DIED IN WAR

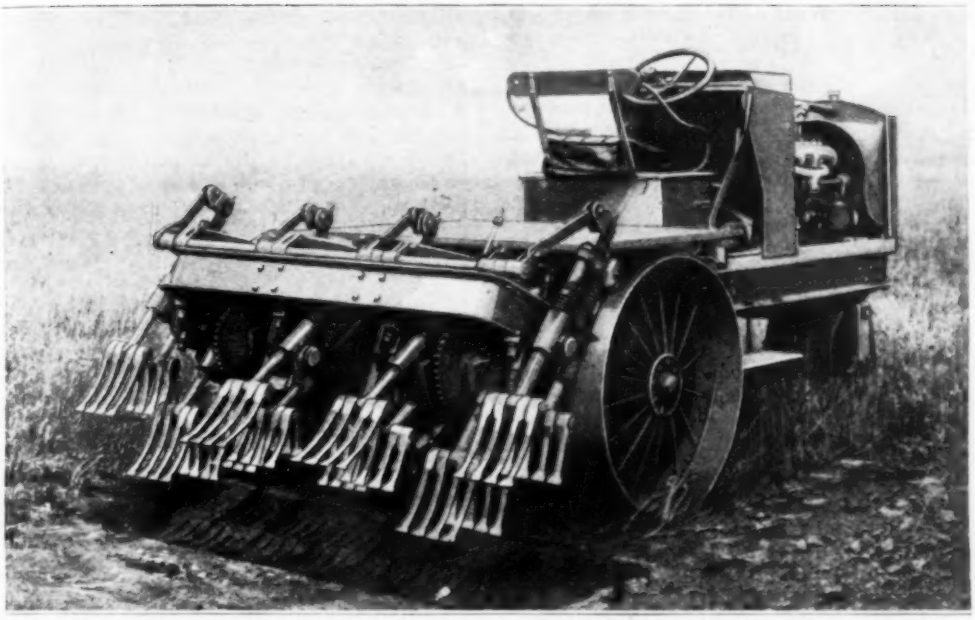
As a mark of personal appreciation, a citizen of College Point, N. Y., has made a beautiful memorial in honor of the 28 boys who marched away from that town and died in the great war. For each hero, the town had a tree planted and a wreath hung upon it. From each of the wreaths, the citizen took one leaf and mounted the collection on a white background. Then he pasted the picture of the man it represented upon the proper leaf, and, in the middle of the artistically arranged group, placed a list of the boys'



A Memorial Made by a Citizen of College Point, New York: The Pictures are Mounted on Wreath Leaves

names. The unit was finally mounted in a glazed frame. The pictures were obtained from a Decoration Day program.

¶Unusually elaborate wireless equipment is to be furnished to a new White Star liner now being built. There will be three wireless stations, the largest being capable of maintaining permanent communication with both sides all the way across the Atlantic.



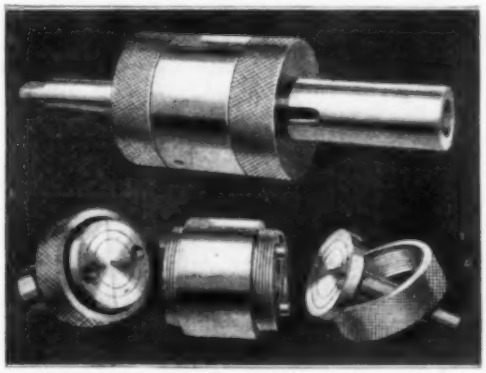
This Machine Replaces Three Other Farm Implements. It will Plow, Harrow, and Cultivate, All in One Operation. It Has a Capacity of Three Acres an Hour. It Uses Either Gasoline or Kerosene as Fuel and Requires About One Gallon of Either to the Acre

"SPADING TRACTOR" PLOWS, HARROWS, AND CULTIVATES

A "spading tractor," which plows, harrows, and cultivates, all in a single operation, was recently demonstrated at Rockford, Ill. It has a tractor body with a series of fork blades attached at the rear. The blades revolve 200 times a minute and throw the dirt 2 ft. into the air. The ground penetration is adjustable, with a maximum of 16 in. Each blade is backed by a spring which yields at a pressure of 600 lb., as a protection against breaking on rocks or other resisting objects in the soil. The tractor is equipped with a 25-hp. engine using either gasoline or kerosene as fuel. About 1 gal. of fuel is required to the acre, and three acres an hour can be spaded. The machine weighs 4,000 lb., but the weight will be reduced to 3,000 lb. by improvements now planned.

PATENT MACHINE-TOOL CHUCK HAS CUSHIONING PROPERTIES

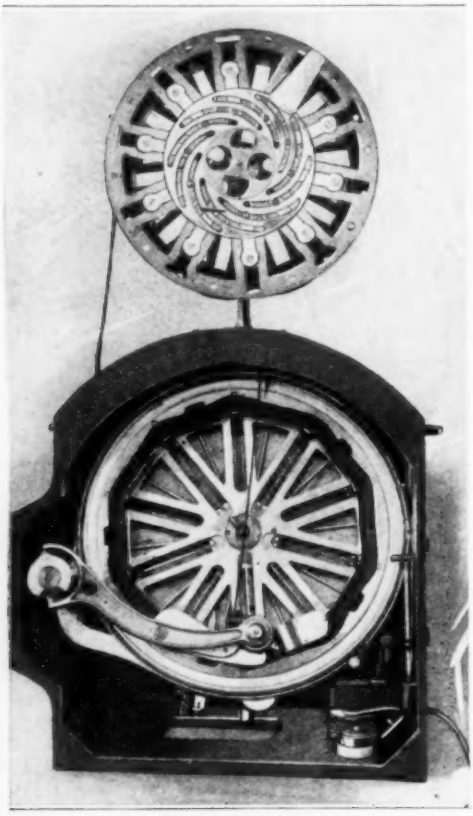
There is a new form of chuck, now on the market, designed to give flexible and shock-absorbing properties that should make it advantageous as a machine-tool chuck, and in a modified form, as a shaft coupling, effective in cushioning the shock of starting, direct-connected machinery, and in absorbing any variations of speed and load. In the case of the tool chuck this is done by making possible a relative rotation, of about 30° in either direction, between the shank and the socket ends of the chuck. During any difference of relative rotation the shock is absorbed by a strong helical spring through which the driving torque is transmitted. As a machine-tool chuck it is made in several sizes for holding drills, dies, taps, and other tools. Its modifications for other uses include couplings for direct-connected shafts on motors, for line shafts, and for cushioning pulleys and gear pinions.



Flexible and Shock-Absorbing Machine-Tool Chuck Shown Assembled and Disassembled: It Holds Drills, Dies, Taps, and Other Tools

FILM REWINDING ELIMINATED BY NEW DEVICE

Motion-picture operators and projecting-room attachés will be glad to learn of a machine which will relieve them of the job of rewinding film. Such a machine is now on the market. It comprises a rotating drum having 10 fingers, which bear outward from the drum center. A governing arm receives the film as it passes down from the upper reel and directs its passage between the fingers and the inside of the drum flange. Each succeeding coil of film is wrapped beneath its predecessor and held in place by the fingers. The latter parts are raised at the proper interval by a cam, to receive the film. In case of a film break, it is necessary only to thread the broken end into the reel for about 3 in. and proceed. When the film is completely wound, it has the form of a decagon, and is in the proper order immediately to commence projection.



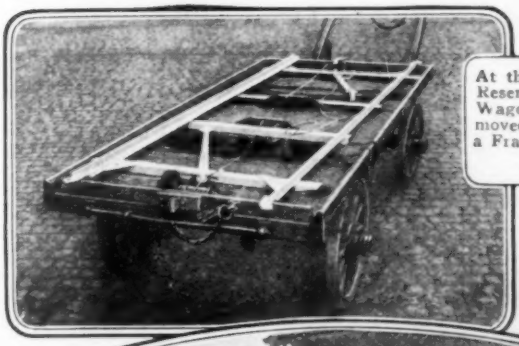
The Film is Fed to the Lower Drum by a Governing Arm. The Drum Reverses the Film Direction and Saves Rewinding

MINERAL OILS BEST FOR USE IN PROCESSING WOOL

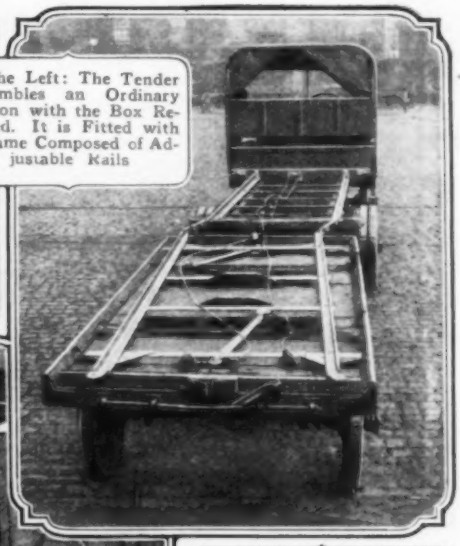
During the processing of wool the natural oil in the fiber is removed and must be replaced in order to complete the treatment. For this purpose an oil is required which will penetrate uniformly, and wash out easily without staining the fabric or being so heavy as to interfere with the rapid-running machinery. Improper oils will permanently ruin the fabric. The most satisfactory oils used are mineral oils because they are free from acid and gum. They are debloomed, or oxidized by the sun, in order to make them easier to wash out. The oiling is usually done during the process of blending two or more grades or colors of wool. Layers of the different grades are spread on a floor, and each layer sprayed with the oil. The oil remains in the wool until it is made into yarn or woven into cloth, when it is scoured out.

LOADING DEVICE DOUBLES VALUE OF TRUCKS

Loads up to four tons can be placed on a truck in five or six minutes by means of the sliding flat which is now being used in England. The flat is a simple platform with flanged or grooved wheels. It is loaded while on the warehouse platform, or resting on a tender, directly from a freight car. The tender is a wagon bed without springs and is fitted with rails upon which the wheels of the flat rest. When the flat is loaded the truck is backed up to the tender and the rails of the latter are coupled to similar rails on the truck by means of hinged arms. The rails on the tender can be moved transversely to the extent of 10 in. to secure alinement, by the use of a lever and chain device. A cable passing about a drum on the truck is hooked to the flat, which is drawn onto the truck with a windlass. It is then fastened by engaging two locking cams, and the coupling arms, which are a part of the truck rails, are folded at right angles as an additional safeguard. The equipment of the warehouse platform is the same as that of the tender. The truck is unloaded by reversing the process. By the use of this system a truck can handle two or three times the ordinary tonnage.

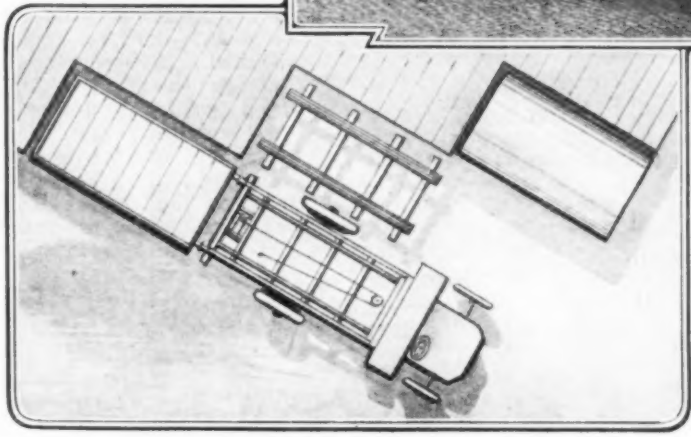


At the Left: The Tender Resembles an Ordinary Wagon with the Box Removed. It is Fitted with a Frame Composed of Adjustable Rails



Above: The Tender Coupled to a Truck. The Misalinement can be Overcome to the Extent of 10 Inches by Means of the Chain and Lever on the Rear Part of the Tender

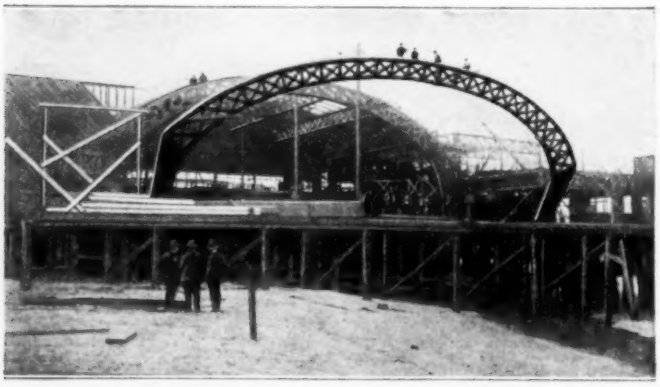
Above: The Loaded Car being Rolled from the Tender onto the Truck. This is Done with a Hand Windlass or with a Windlass Operated by the Truck Motor. It Is This Quick Loading, Making Possible Utilization of the Full Time of the Truck, Which Makes the Device Valuable



Above: The Flat has been Placed on the Truck, only a Few Minutes having been Required for Loading. The Unloading can be Accomplished Just as Quickly. At the Left: The Diagram Shows How a Specially Constructed Warehouse Platform can be Arranged to Facilitate Quick Handling When This System is Employed

ROOF TRUSS PLACED IN POSITION QUICKLY

Each of the three trusses supporting the roof of what is said will be the largest built-over-the-ocean dance pavilion in the world, was constructed on the ground and then lifted into position by an electric hoist in 40 minutes. The trusses, 45 ft. high and with a span of 110 ft., are constructed of pine and iron, and weigh 19 tons each. The ballroom is to be one of the attractions on a new amusement pier at Venice, Calif., and will have a floor space of 36,000 sq. ft., besides loges, check rooms, dressing rooms, soda fountain, etc. It is estimated that the floor will comfortably accommodate 1,000 couples at one time.



Lifting One of the 19-Ton Roof Trusses in Place in 40 Minutes by Means of an Electric Hoist

SMALL AIRPLANE SPEEDSTER MAKES RECORD RUN

A tiny aeroplane, of the single-plane type, recently established a remarkable speed record when it made 130 miles an hour, at Los Angeles, Calif. It was especially constructed to take part in the International Air Tournament held at the Speedway of that city in June. Among its many unusual features, the plane has a headrest for the pilot and facilities for making sharp turns. Its wing spread is 21 ft. 9 in., weight 885 lb. without the pilot, and lifting area, 112 square feet.

Although Equipped with Only a 90-Horsepower Engine, This Tiny Plane Made 130 Miles an Hour. Its Wing Measures 21 Feet 9 Inches

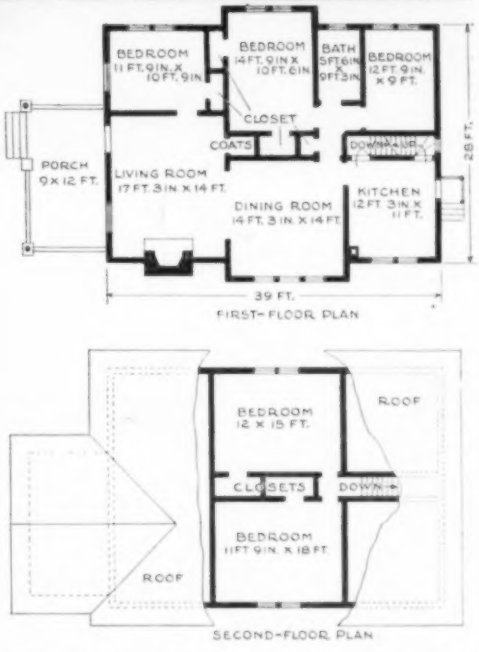
WORK OF PASTEUR INSTITUTE DURING THE WORLD WAR

A description of the work of the Pasteur Institute in France during the war, by Dr. A. Calmette, the assistant director, shows the great results achieved under pressure. At the beginning of the war the institute owned 273 horses, producing serums, and had a capacity of 80,000 vials a month. After the mobilization most of the personnel was depleted, but the demands for the serum increased tremendously. The equipment was not equal to the demand, and additions had to be installed. It became necessary to work nights, and on Sundays and holidays, without rest. The number of horses increased to 1,462, and from August, 1914, to the end of 1918, 6,000,000 doses of serum were produced for France, 3,700,000 of which were given free to the army and public charities. Nearly 1,000,000 doses were delivered to Italy, 10,000 to Serbia, 70,000 to Belgium, 40,000 to Roumania, and 800,000 to the American army and Red Cross. During the German offensive in 1918, the daily output was 20,000 antitetanus-serum vials.

Suburban Dwelling Built of a Weather and Fireproof Material Composed of a Combination of Portland Cement and Long-Fiber Asbestos, Hydraulically Compacted under a Pressure of 3,000 Tons

ASBESTOS BUILDING MATERIAL HAS MANY GOOD PROPERTIES

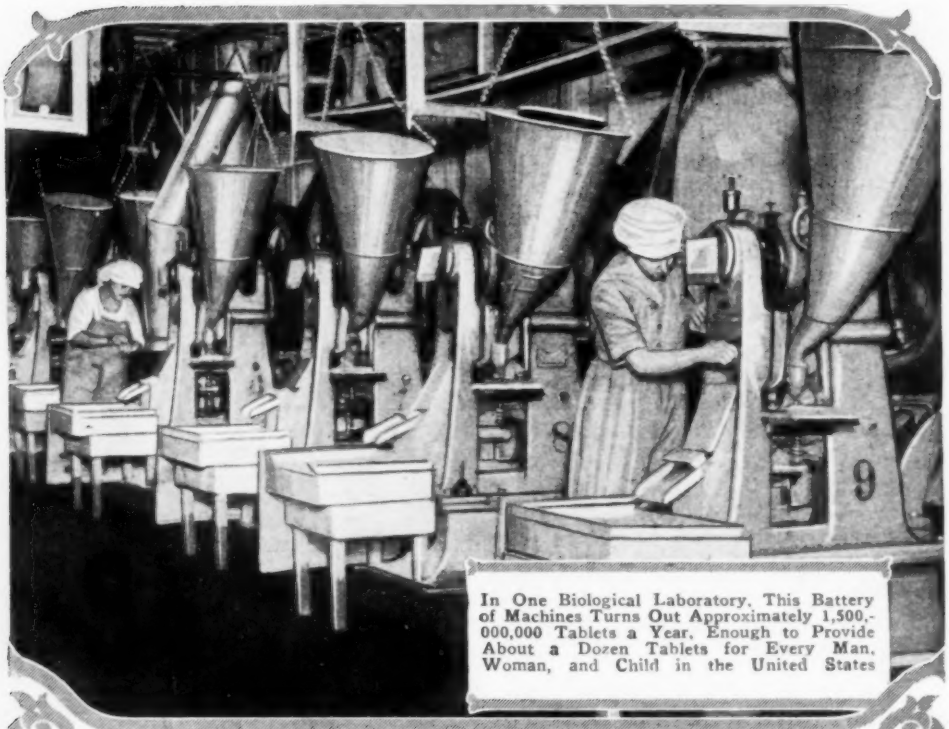
The fireproof and nonconducting properties of asbestos have for a long time been taken advantage of in various forms of building material, but never so extensively as in buildings ready for erection that have for some time been produced in many sizes and designs in Pennsylvania. The slabs from which these buildings are constructed are composed of a combination of Portland cement and long-fiber asbestos, hydraulically compressed under a pressure of 3,000 tons to the square foot. Their color is a light gray, and the surface perfectly smooth, giving a finish that does not require paint. These buildings are employed largely as suburban homes, and they have also been used as one and two-room schools.


BEDROOM 11 FT. 9 IN. X 10 FT. 9 IN.
BEDROOM 14 FT. 9 IN. X 10 FT. 6 IN.
BATH 5 FT. 6 IN. X 9 FT. 3 IN.
BEDROOM 12 FT. 9 IN. X 9 FT.
CLOSET
COATS
DOWN
PORCH 9 X 12 FT.
LIVING ROOM 17 FT. 3 IN. X 14 FT.
DINING ROOM 14 FT. 3 IN. X 14 FT.
KITCHEN 12 FT. 3 IN. X 11 FT.
28 FT.
39 FT.
FIRST-FLOOR PLAN
BEDROOM 12 X 15 FT.
ROOF
CLOSETS
DOWN
BEDROOM 11 FT. 9 IN. X 18 FT.
ROOF
SECOND-FLOOR PLAN

First and Second-Floor Plans of the Cement and Asbestos Building-Material Dwelling That Is Both Weather and Fireproof: The Plans Give All Sizes and Details in the Notations

GOVERNMENT UNDERTAKES BIG PROJECTS IN PALESTINE

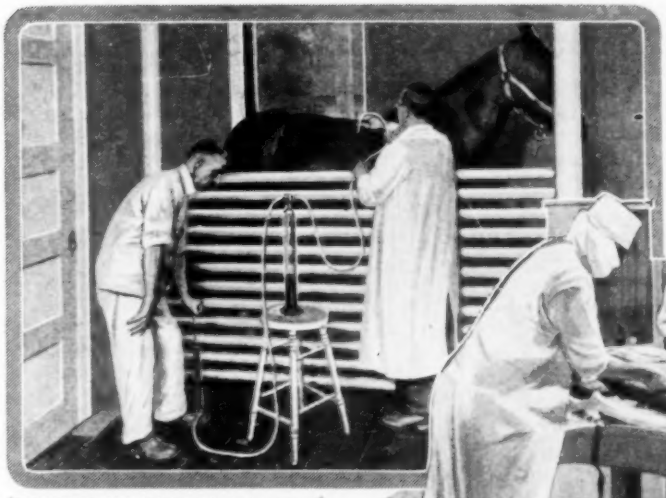
The government of Palestine has planned a number of improvements which have been urged by the orange growers and shippers of that country. Of these the enlargement of the ports of Jaffa and Haifa will probably be accomplished at an early date. The other projects are: the erection of a water-power plant large enough to meet the needs of all Palestine; the irrigation of the Jordan River Valley, and the construction of a railroad from the Sea of Galilee directly eastward, to connect with the Bagdad railway, which, together with the Anatolian railway, forms a direct line connecting Constantinople and the Persian Gulf.



In One Biological Laboratory, This Battery of Machines Turns Out Approximately 1,500,000,000 Tablets a Year, Enough to Provide About a Dozen Tablets for Every Man, Woman, and Child in the United States

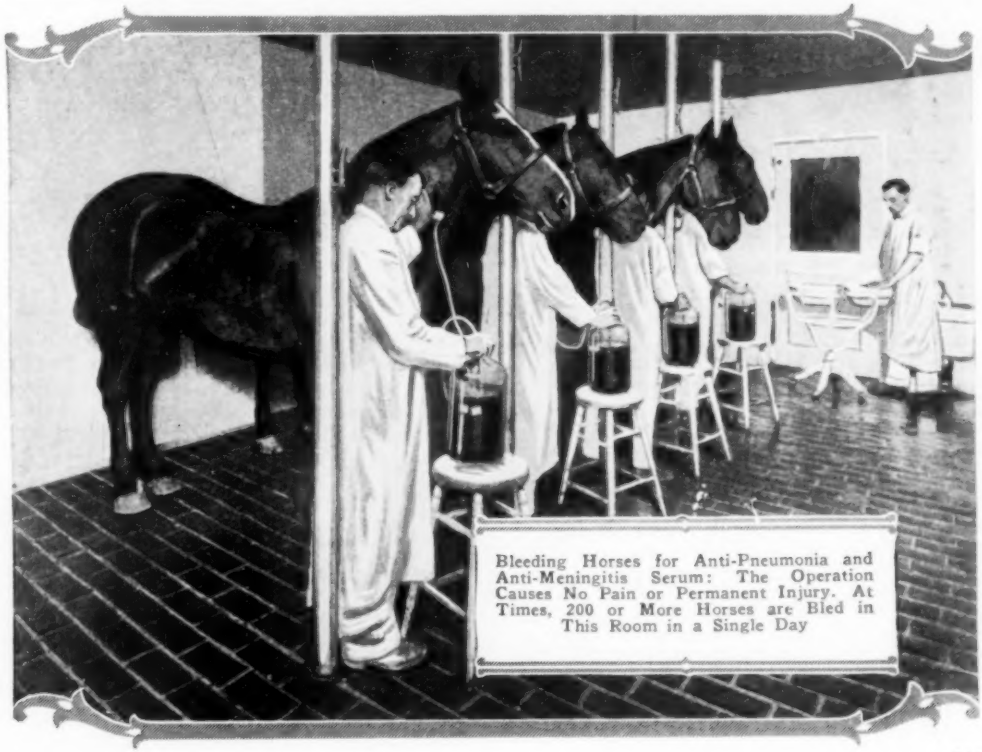
Before the War This Country Depended on Europe for Many Drugs Which We Now Produce. Here is Shown an American Field of Hyoscyamus (Henbane), a Plant Which Yields a Drug for Treating Neuralgia

SERUMS IN A BIOLOGICAL LABORATORY



Diphtheria and Tetanus, or Lockjaw, Antitoxins are Produced by Inoculating Horses. An Injection of Serum is Given the Horse Every Five Days for a Period of Three to Six Months Before a Yield of Antitoxin is Obtained

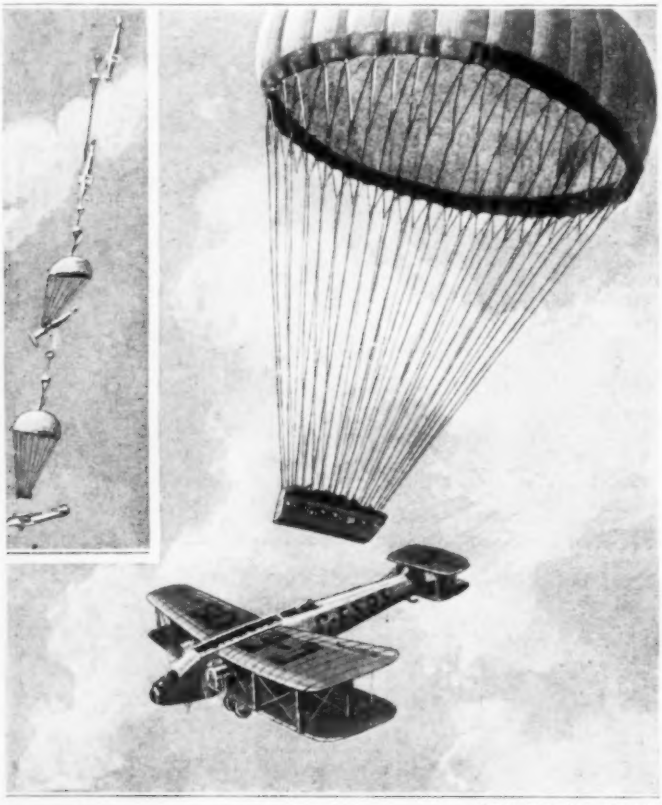
Removing Smallpox Vaccine from the Body of a Calf: The Equipment, Precautions, and Technique Used in This Work Are as Elaborate as Those Employed in the Operating Room of Any Modern Hospital. The Calves are Killed Before the Vaccine is Removed



Bleeding Horses for Anti-Pneumonia and Anti-Meningitis Serum: The Operation Causes No Pain or Permanent Injury. At Times, 200 or More Horses are Bled in This Room in a Single Day

PARACHUTE LIFTS PASSENGER CABIN FROM DISABLED PLANE

An attempt to protect passengers in case an airplane becomes disabled is seen in a recent parachute invention. The passenger cabin is inside of the fuselage of the airplane, as usual, but it is built separately and is detachable. In case the pilot loses control of the plane, he can instantly release a small parachute by pulling a lever. When this parachute opens, its pull releases a slightly larger one, and the combined pull of the two slits a ripping panel, setting a third parachute free. This one is large enough to lift the entire cabin from the fuselage of the disabled and falling airplane and bring it to a safe landing.



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The Cabin of This Airplane is Set into the Fuselage but is Detachable. It is Equipped with a Parachute Which can be Released in Case of Accident. It is Shown Lifted Clear of the Disabled Plane by the Parachute

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¶An American company has been awarded a contract for the construction of five locomotives for the Chinese government, each of which will cost more than $50,000.

BUGS AND PLANTS INTERFERE WITH ELECTRICAL APPARATUS

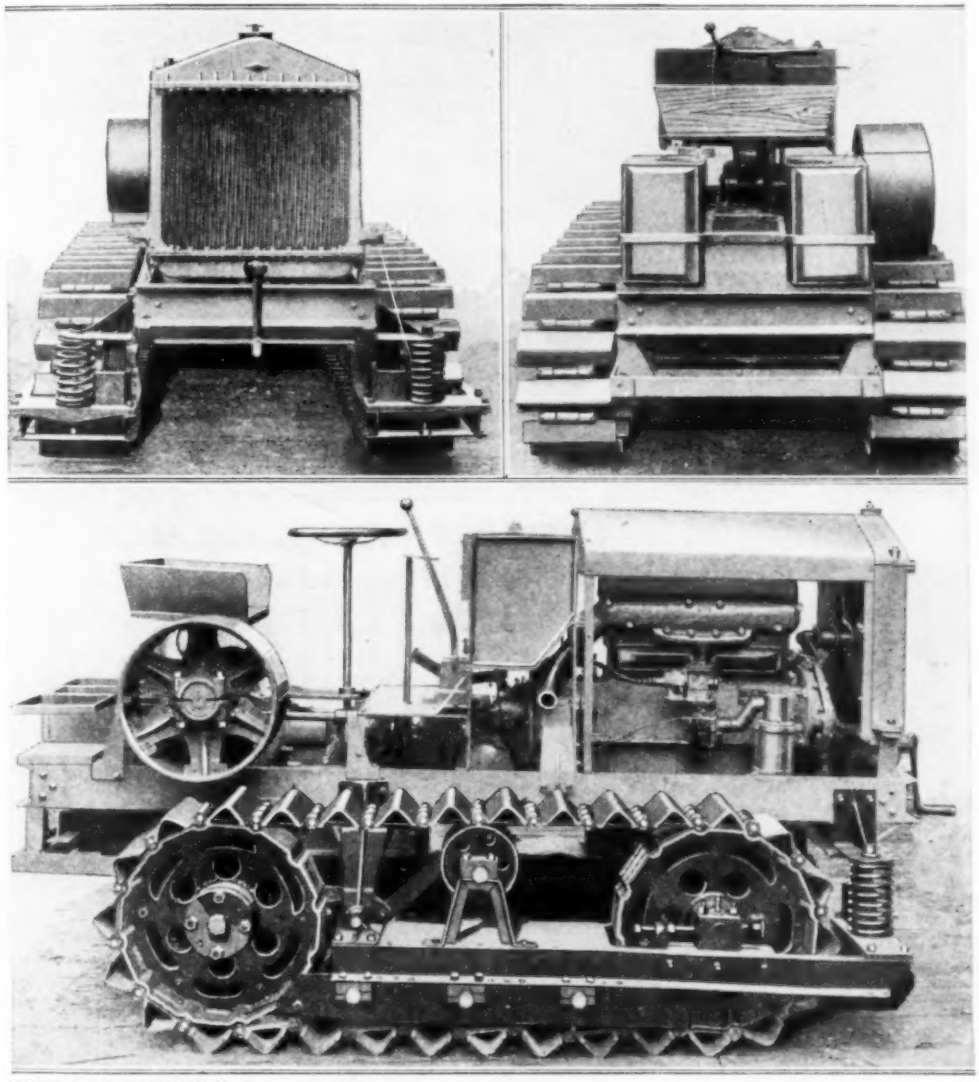
Plant and insect life in some tropical countries are a serious hindrance to the successful operation of electrical installations. Southern India is bothered with a white ant which eats the paraffin and braid insulation from annunciator wires. Such wires are now covered with a weatherproofing material which the ants do not relish. Brazil and other South American sections are pestered with a large spider which spreads its web from wire to wire. At night the web gets wet with dew and becomes a good conductor. Short-circuiting takes place and ties up the service until the web is brushed away. On board ship, rats cause trouble by eating insulation from electric wire, and manufacturers now mix poison in the insulation material. In Porto Rico the so-called air plant attaches itself to telephone wires and accomplishes about the same result as the spider web of Brazil. Its runners get wet and cross other wires. Probably the worst of all the pests is a borer which eats its way through the lead covering on armored cables. Water leaks through the holes and reaches the conductors, causing serious short circuits. Although at first thought, these conditions seem rather amusing, they are nevertheless quite serious when considered in terms of resultant money losses.

LIBRARY CENSUS SHOWS NEED OF EXTENDING SERVICE

A recent census shows that of the 2,964 counties in the United States, only 794, or 27 per cent, have one or more libraries of 5,000 or more volumes. Thirty of the 48 states serve less than one-half their population, six serve less than one-tenth, and one less than two per cent. These statistics reveal a deplorable lack.

CONTINUOUS-TREAD TRACTOR HAS NEW FEATURES

Light or heavy duty can be performed by the latest improved continuous-tread tractor now on the market. It will make 2½ miles per hour with four plows through heavy soil, or 10 miles an hour as a road-drag puller. The treads of the tractor are detachable, accounting for its versatility. Within less than two hours after starting to detach the continuous treads, rubber-tired truck wheels can be applied, making the tractor useful on the highways. Another very good feature in connection with the new machine, is a separate shaft for the pulley wheel. Varying belt conditions between the tractor and hullers, or separators, can be met by the operator without loss of power from the engine, as the shaft is separately geared. Four speeds in the tractor transmission make possible an easy take-off.



PHOTOS COPYRIGHT, KEYSTONE VIEW CO.

Within Two Hours the Treads of This Tractor can be Removed and Rubber-Tired Truck Wheels Fitted in Their Stead. Upper Left: Front View of Tractor. Upper Right: Rear View, Showing Location of Fuel-Supply Cans. Below: Side View, Showing the Extra Shaft and Pulley for Belt to Hullers or Separators. The Separately Geared Shaft Permits Tightening or Slackening of the Belt

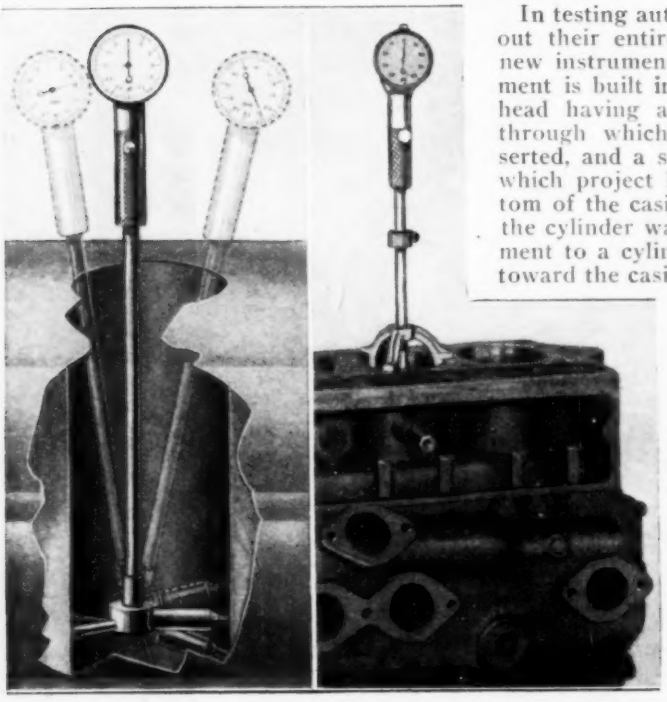
CALIFORNIA MINE-RESCUE WORK DONE BY TRUCK

Because the California mines are inaccessible to the standard mine-safety railroad car, a special rescue truck has been provided by congress for that state. The car seats 10 men and carries an oxygen-breathing apparatus for each man; a supply of oxygen totaling 600 cu. ft., distributed in six cylinders; two oxygen inhalators; 10 safety lamps; two army stretchers; an ample supply of regenerating material; caustic soda and sodium hydroxide, for use in oxygen-breathing apparatus; a high-pressure power pump, to pump oxygen into the bottles for the breathing apparatus; a complete first-aid kit, and a 1,000-ft. life line. Gas masks are not included, since they have been found useless in mine fires.

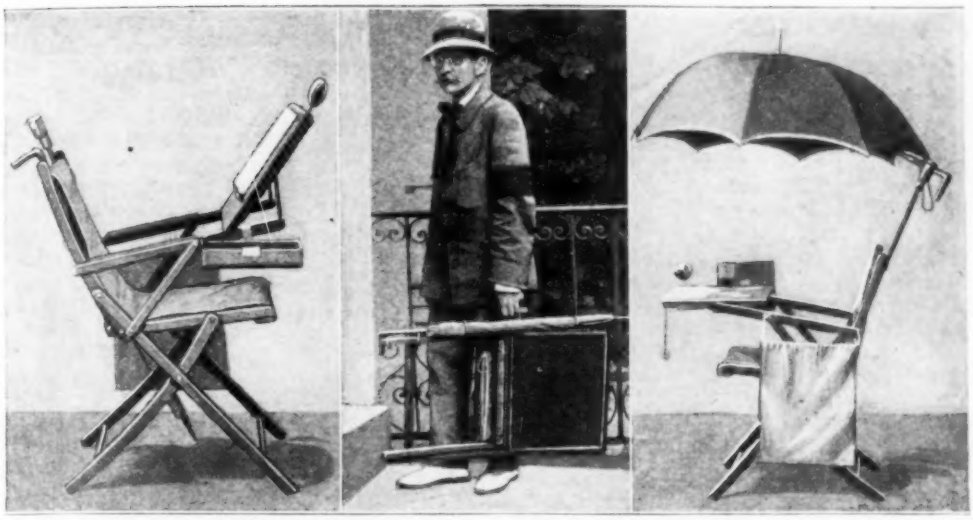
This Oxygen-Breathing Apparatus Is a Part of the Equipment of the Mine-Rescue Truck Used for California Mines. The Gas Mask Is No Protection against the Gases Liberated in Mine Fires

DEVICE TESTS CYLINDERS FOR ROUNDNESS

In testing automobile cylinders throughout their entire length for roundness, a new instrument is of value. This instrument is built in three sections, namely, a head having a recording dial, a casing through which a connecting rod is inserted, and a set of cam-operated feelers which project horizontally from the bottom of the casing and make contact with the cylinder wall. In applying the instrument to a cylinder, the feelers are drawn toward the casing by pressing a button on a knurled collar near the instrument head. The feelers are released when inside the cylinder, and as the instrument is rocked back and forth, rub against the cylinder walls. Any irregularity in the shape of the bore will be recorded through the connecting rod on the indicating dial, which is graduated in calibrations of .001 inch. For gauging many cylinders of the same depth, a stop collar that attaches to the connecting rod is provided. The tester is light and is easily handled.



Left: The Feelers of the Gauging Device Rub the Cylinder Walls and Communicate the Eccentricity to the Dial Above. Right: Gauge with a Stop Collar for Use Where Production Gauging Is Necessary



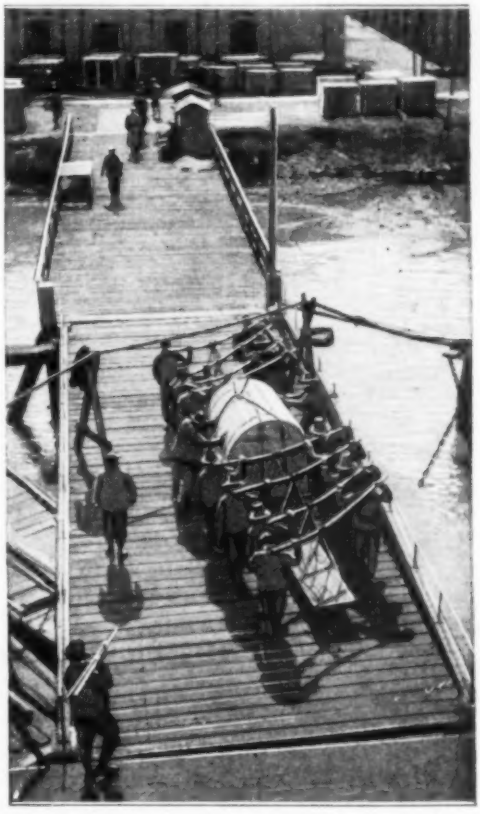
The Collapsible Armchair Weighs Only Eight Pounds and, Folded, Is 3½ Inches Thick. Left: The Chair Assembled, with Desk Part as an Easel. Middle: Folded for Carrying. Right: Desk Ready for Use, with Sunshade Up and Accessory Bag at the Side

COLLAPSIBLE ARMCHAIR HANDY FOR TOURISTS

A very handy folding chair has been invented by a Frenchman. Its almost negligible weight of 8 lb., as well as the many uses to which it may be converted, make it an extremely desirable part of a tourist's outfit. It is constructed of canvas and a light wood frame, and by the use of detachable parts is easily transformed into a desk, pulpit, easel, or horizontal writing table. Numerous accessories, such as pencils, erasers, a water bottle, an adjustable rear mirror, a graduated rule, and the small table may be placed in a waterproof bag when not in use and folded with the chair part. A universally adjustable umbrella is also provided. When collapsed, the unit is but 3½ in. thick, and can be carried by a handle or by shoulder straps.

PRIMITIVE FREIGHT HANDLING IN ORIENTAL SEAPORTS

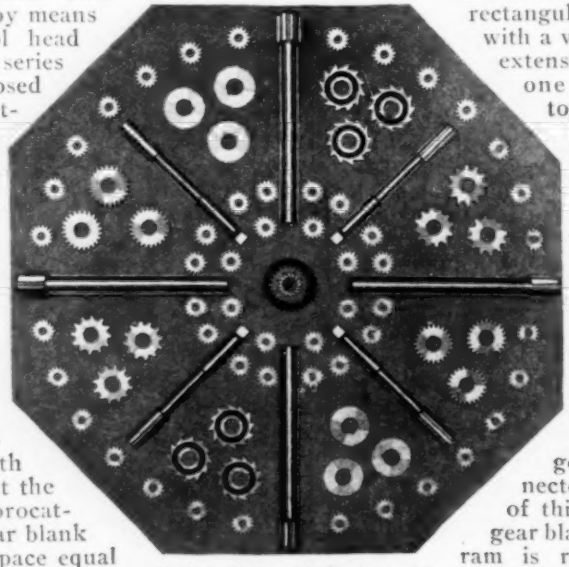
In striking contrast to the modern machinery seen on the docks of this country and Europe, is the equipment still in use for handling freight in many seaports of the Orient. Cheapness of coolie labor causes an utter disregard for the number of men employed on a single job. One common method is to place a piece of heavy freight upon a 2-ft. plank about 30 ft. long. The plank is suspended from poles with slings, and the coolies, one at each end of a pole, carry it away. The method requires good teamwork, some headwork, but chiefly many strong men.



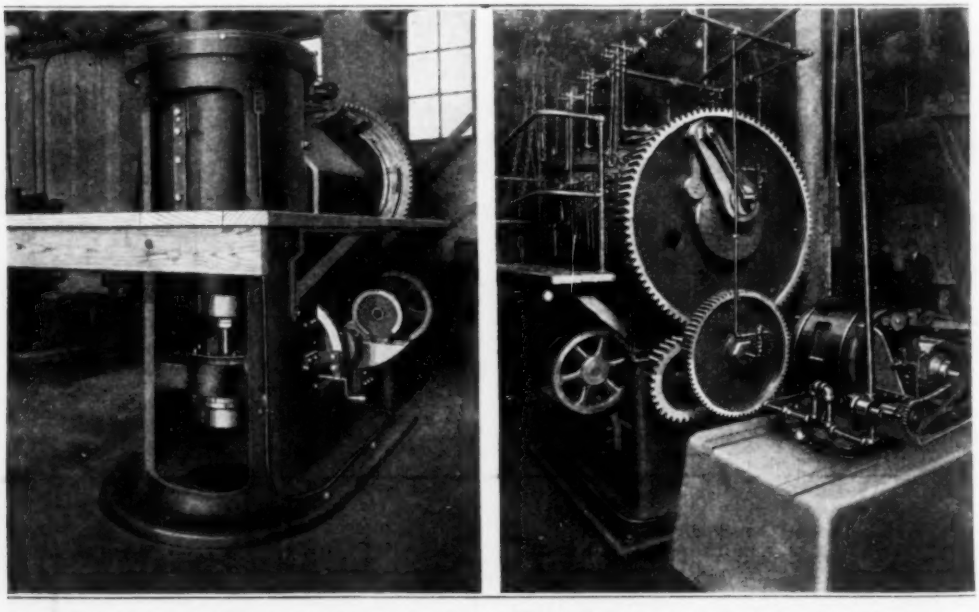
Man Power has Never been Replaced by Machinery on These Docks, Where Cheap Coolie Labor Is Available

SHAPER CUTS GEAR TEETH IN MULTIPLE

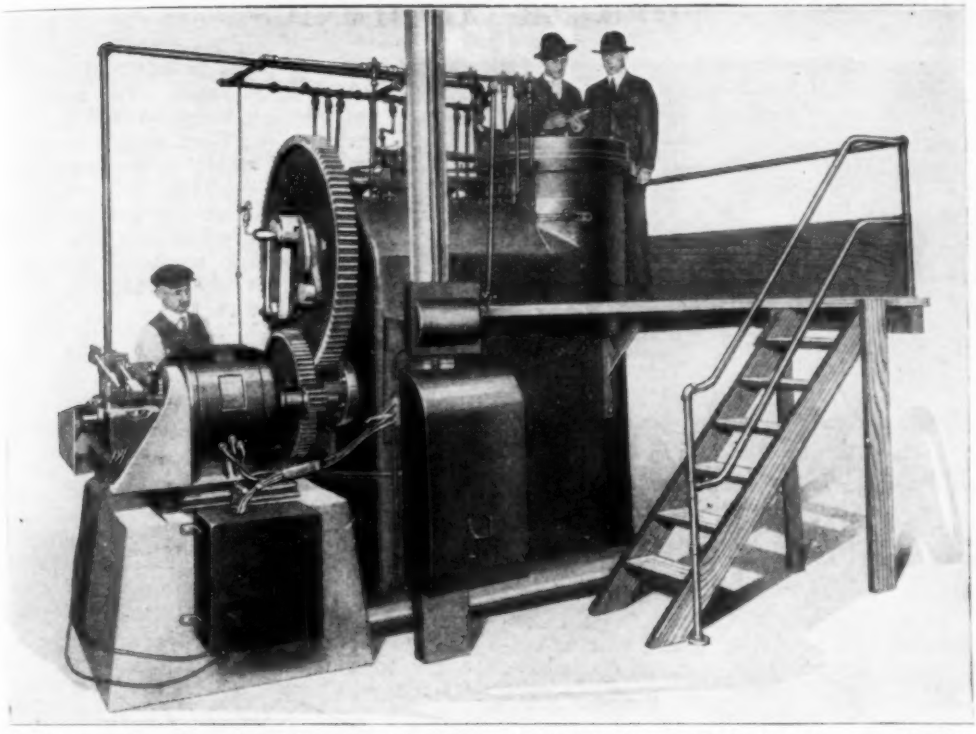
In gear cutting, all the teeth, or a multiple number of them, can be cut at one operation in a multiple-tool shaper that is now on the market. This is made possible by means of a special tool head which contains a series of radially disposed tools with their cutting ends spaced around the circumference of the blank from which the gear is to be cut. The cutting is done by reciprocating the blank, to and fro, past these stationary cutters, which are automatically fed forward until the teeth are completed. At the end of each reciprocating stroke the gear blank is rotated for a space equal to one tooth, presenting to each tooth a tool different from that which made the previous cut. When the tools have been fed to the full depth of the tooth they remain stationary, while the gear blank makes one complete revolution, thus finishing all the teeth alike, and insuring uniformity. The frame of the machine is in the form of a rectangular cast-iron box with a vertical cylindrical extension above it at one end, under the top cover of which is mounted the stationary tool head. Beneath this, and on the center line of the cylinder, is a vertical ram in which is journaled a spindle with a socket at its upper end for carrying the arbor to which the gear blank is connected. It is by means of this spindle that the gear blank is rotated. The ram is reciprocated by a crank head at the end of a horizontal shaft, which is carried in bearings across the inside upper part of the rectangular frame of the machine to its other end, where the shaft is driven by a



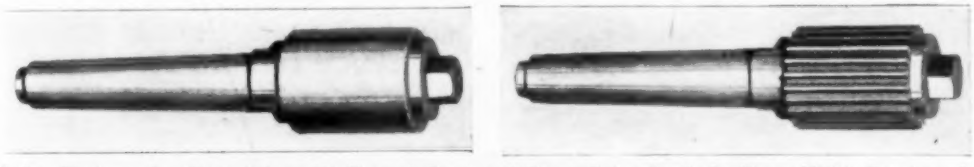
Display of Special Devices, All of Which were Made by the Shaper That Cuts Gears in Multiple: It is Seen That It Cuts Other Devices Besides Gears



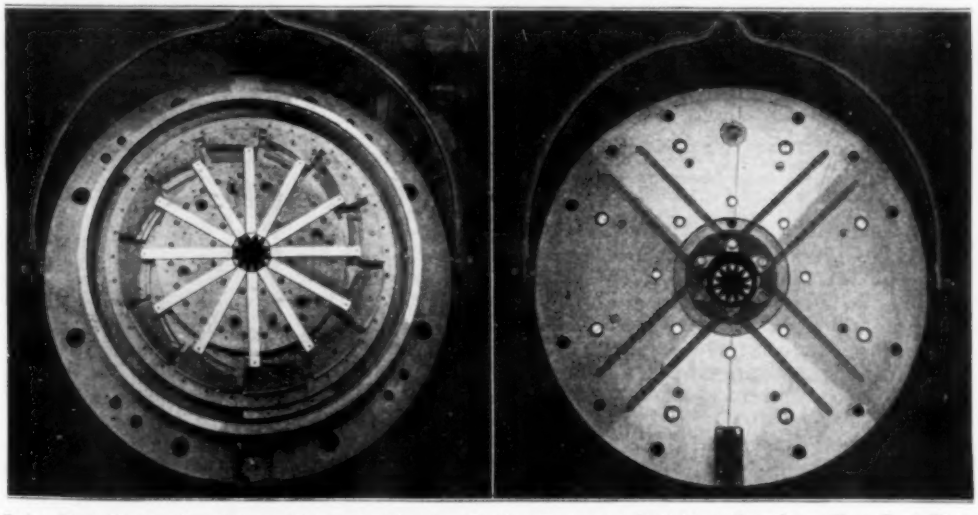
Left: Front View of Multiple-Tool Shaper Showing Cylindrical Housing of the Stationary Tool Head Above, and below This the Reciprocating Ram That, in Connection with a Spindle and Arbor, Moves the Gear Blank To and Fro Past the Cutting Tools. Right: Rear View Showing Driving End of the Machine



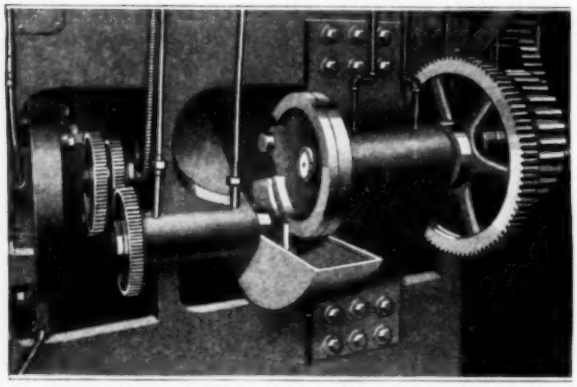
Multiple-Tool Gear Shaper That at the Operating Platform End Cuts All the Teeth of a Gear, or a Multiple Number of Them, at One Operation: The Motor at the Other End Drives the Machine by Means of a Horizontal Shaft to Which It is Geared



Left: Blank on Its Work Arbor with Tapered Shank and Thrust Collar, Ready for Shaper Which Cuts from It the Gear Shown to the Right



Left: Tool Head with Bottom Removed, Showing Cutting Tools and Individual Cam Lugs That Feed Them Forward as Cutting Progresses. Right: Top of Tool Head



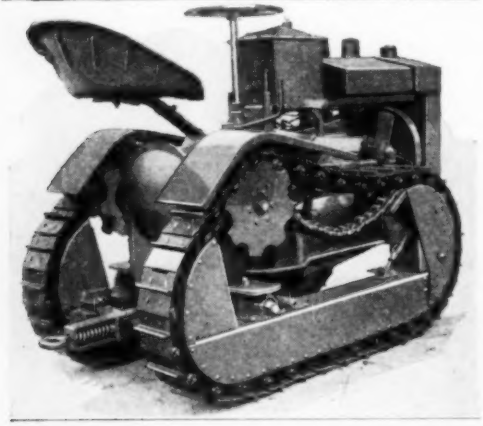
Close-Up of Indexing Mechanism on One Side of Machine: By Varying the Ratio of the Change Gears Seen to Left, Indexing Movements for Any Desired Number of Teeth may be Obtained

train of gears in connection with an electric motor. The machine is 7 ft. high, weighs 17,000 lb., and requires a 100-hp. motor to drive it at full capacity, cutting gears of 12-in. diameter with a 6-in. face. The machine is adapted to cut other products, in fact, anything having teeth or grooves, such as sprockets, reamers, taps, and similar things.

¶ The rapid increase in the use of fuel oil is indicated by the fact that, whereas in 1913, 60,000 tons of ships were fitted with Diesel oil engines, last year there was a tonnage of 454,502 so fitted.

RECENTLY DESIGNED TRACTOR GREATLY SIMPLIFIED

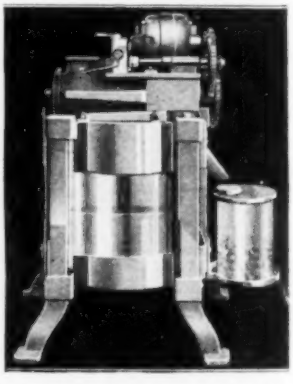
Many improvements have been incorporated in a new tractor and tractor cultivator. Unusually high-grade steels have been used with the object of reducing the weight. In its design the aim was the maximum of simplicity and accessibility. There is no main frame, the motor, transmission, and differential assemblies being bolted together into one solid unit from front to rear, insuring rigidity and alinement of the power plant at all times. Thus the size and weight of the machine are reduced without sacrifice of power. Lubrication is supplied from the combined motor and gear case to all parts of the machine. There are no oil or grease cups. It has a four-cylinder motor with the usual equipment, and the transmission is unusually simple. There is one speed forward and one reverse. The track shoes are of hardened chrome steel, and present a continuous solid tractive surface that tends to keep out mud and dirt. The tractor weighs only 1,820 lb., and is capable of plowing six to eight acres a day with a standard two-bottom 12-in. plow, and will disk or harrow 20 to 25 acres. It delivers 16 hp. with the belt.



Newly Designed Tractor That Weighs Only 1,820 Pounds, and will Plow Six to Eight Acres a Day with a Standard Two-Bottom 12-Inch Plow, or Disk or Harrow 20 to 25 Acres

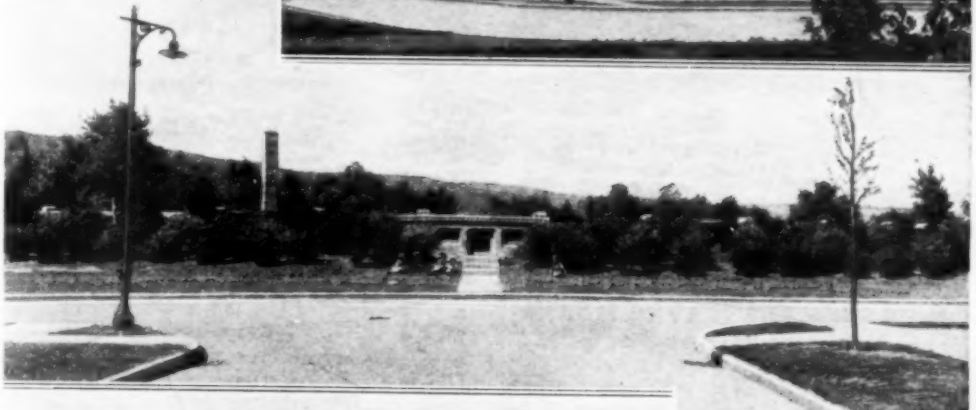
SODA-FOUNTAIN PRESS MAKES ORANGE DRINKS TO ORDER

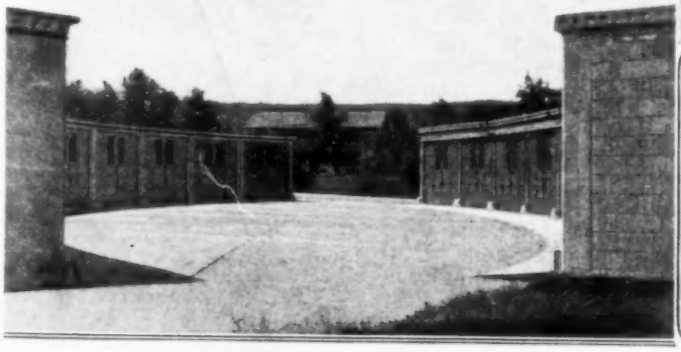
Everybody likes to "see the wheels go round." This has been taken advantage of in the construction of a new soda-fountain apparatus which grinds, crushes, and presses oranges, skins and all; mixes the resulting juices with a specially prepared sirup, and delivers the drink to the patron in a fraction of a minute. The whole operation is conducted in full view of the customer, which has the effect of seemingly shortening the waiting time. The device is highly ornamental, being made of polished aluminum, nickelplated steel, and fine glass. An electric motor and exposed driving gears, mounted at the top, heighten the mechanical effect.



DULUTH ADOPTS SYSTEM OF COMMUNITY GARAGES

The Community Garages Are of Two Types. At the Right is Shown One of the Rectangular Style. Below: One of the Round Style. Landscape Gardening has been Applied to Hide This Building. The Spot Has the Appearance of an Attractive Little Park





At the Left, the Interior Court of a Round Garage is Seen. Eight by Nine-Foot Entrances Admit the Cars to the Stalls, Which Are 11 by 19 Feet, Contain Work Benches, and Afford Ample Storage Space. Each of the Stalls is Thoroughly Heated and Lighted. The Roof, Sloping Back from the Doors, Together with Drain Pipes, Prevents Obstruction by Freezing When It Rains or When Snow Melts

Community garages have been introduced in Duluth, Minn., which show some decided advantages over the usual individual garage. With the aid of good architecture and landscape gardening the structures add to the appearance of the neighborhood, and back yards are left free for gardens and playgrounds. A saving is made in the cost of constructing buildings and driveways and the heating problem is simplified. A single plant heats all the rooms most economically and all rooms are kept at a minimum temperature of 40° even in the severest winter weather. There is a solid wall between each group of four rooms. This not only serves to keep the whole building from becoming chilled if one tenant leaves his door open too long, but also confines any fire which may get started. The other partitions are of concrete to a height of 3 ft. and of galvanized-wire netting the rest of the way to the ceiling. The construction is of hollow concrete blocks, metal lath, and cement plaster.

¶A new instrument for detecting the presence of fire damp (methane) in mines is being tested in England. It is called a methanometer, and depends for its operation upon the expansion of a liquid in a closed tube. The tests are not yet complete enough to determine its practical value.

This Workshop Stands at a Road Intersection in California. The Owner, Who Is Also the Workman, Makes Beautiful Articles of Green Willow, Oak, Maple, and Sycamore. With Rent and Materials Free, He can Sell to Tourists at a Low Price

NEW LIFE PRESERVER MAKES SINKING IMPOSSIBLE

A new form of life preserver, soon to be placed on the market, consists of an inflated rubber sheathing covering two air-tight curved metal chambers and resembles a large bologna sausage hinged in the middle. It is worn around the neck and will support a weight of 500 pounds. No impediment is offered to swimming, but when effort ceases the body assumes a perpendicular position, with the chin above water.

WAYSIDE WILLOW WORKSHOP IS ROOFED BY THE SKY

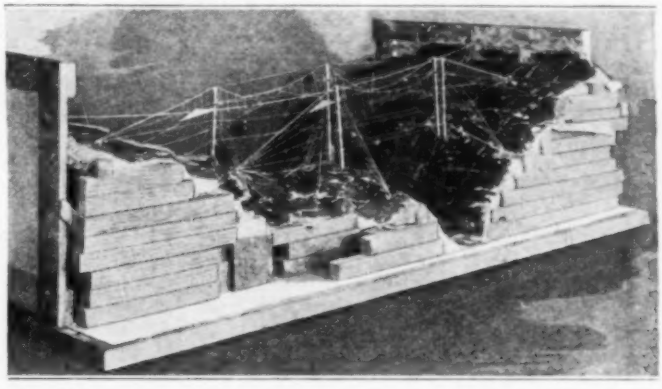
With the sky as the roof of his workshop, a willow-work expert manufactures his line of flower baskets, rustic seats, dog kennels, etc., at the curbstone of a road intersection in California. Being the workman himself, and with no rent or other overhead expense, he can price the articles substantially lower than his competitors. The shop is located near the world's largest ostrich farm and draws a brisk trade from the passing tourists. If the desired article is not in stock for the moment, the customer may specify his want and the craftsman will make it while he waits. The raw material for the open-air factory is the green willow, oak, maple, and sycamore from an adjacent arroyo. The sun is said to shine 300 days of every year in that locality, so the owner need anticipate but few idle days on account of the weather.

NEW PHONOGRAPH REPEATER IS VERY SIMPLE

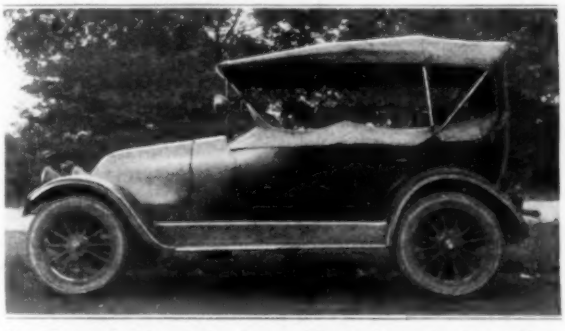
A new phonograph-record repeater which is extremely simple in construction and operation, has recently been marketed. It is a piece of flat, curved material with a spiral groove, designed to lie on the surface of the record. At the outer edge of the groove is a straight bar, along which the needle slides as the record revolves. The pressure of the needle against this bar also restrains the repeater from rotating with the record. When the needle passes the inner end of the bar, the repeater spins with the record for one turn and backs up behind the needle. The needle then travels in the spiral groove of the repeater to the starting point, and the record is played again.

CONCRETE EQUIPMENT BUILT TO FIT CLAY MODEL

A model in clay, reproducing in detail the site of a dam in Switzerland, served an American manufacturer as a means of designing mixers, steel towers, and chutes that would properly mix and place the quantity of concrete necessary in so large a structure. The towers for the raising of the material and the distributing chutes, all guyed into position, were erected to scale on the miniature model before any attempt was made to fill the order. This preliminary study covered a period of three weeks, but with the information, every contingency was provided for. Photographs of the model, together with instructions and marking of the individual pieces, simplified the assembling and erection of the material when it arrived in Switzerland.



This Model Represents the Correct Contours of the Site of a Dam in Switzerland. The Network of Wires and Posts Is a System of Concrete Towers and Chutes That Enabled an American Manufacturer to Ship the Correct Equipment



The Entire Inside of the Automobile is Covered with a Neat-Fitting Dust Cloth. It is Quickly Removed and Keeps the Car Interior Clean

COVER PROTECTS CAR INTERIOR FROM DUST

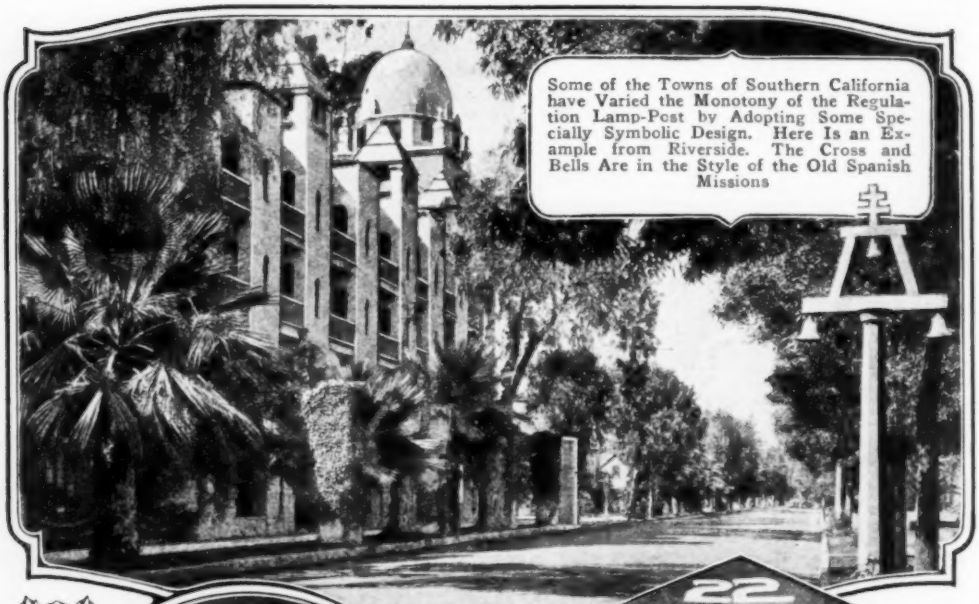
A Chicago physician, wishing to protect the seats of his car from gathering dust when parking in the downtown section, has designed a cover that will fit over the seats and wheel. A special pocketlike piece covers the steering wheel neatly, and the whole buttons down snugly to the sides. The contrivance has proved very effective against the dust clouds that generally settle on parked cars.

FLOW AT ANGLE MAINTAINED BY FLEXIBLE JOINT

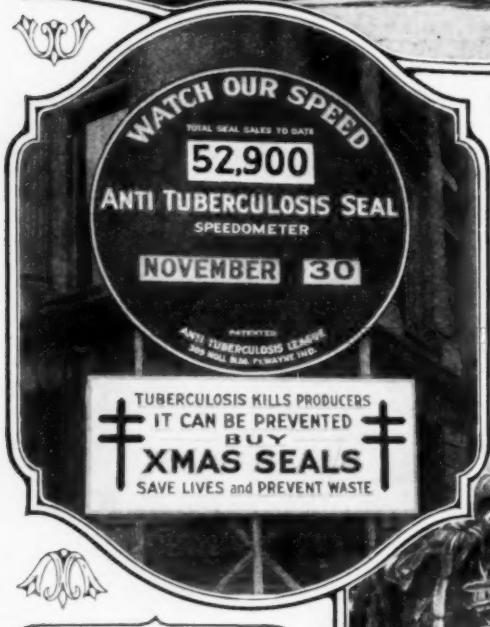
A flexible pipe joint that will permit the flow of material even if each section of pipe is placed at as sharp an angle as 20° is being manufactured in sizes from ¾ to 30 in. in diameter. A packing made of heavy tire-stock rubber takes up the vibrations and expansion. It is claimed that the packing will not wear out for several years, and that the joints are absolutely tight under pressure. The joint can be obtained in different metals, including cast steel, brass, and bronze.

Six Sections of Pipe Bolted Together with the New Flexible Joints to Make an Angle of About 120 Degrees

CIVIC FEATURES THAT PROMOTE THE COMFORT



Some of the Towns of Southern California have Varied the Monotony of the Regulation Lamp-Post by Adopting Some Specially Symbolic Design. Here Is an Example from Riverside. The Cross and Bells Are in the Style of the Old Spanish Missions



Enumerating Device, Combined with Advertising Matter That is Used Each Year by the Anti-Tuberculosis League of Fort Wayne, Indiana: It Is for the Purpose of Pushing the Sales of Anti-Tuberculosis Seals, and is Aptly Called a "Speedometer." A Number of Other Cities have Decided to Install Similar "Speedometers" This Winter

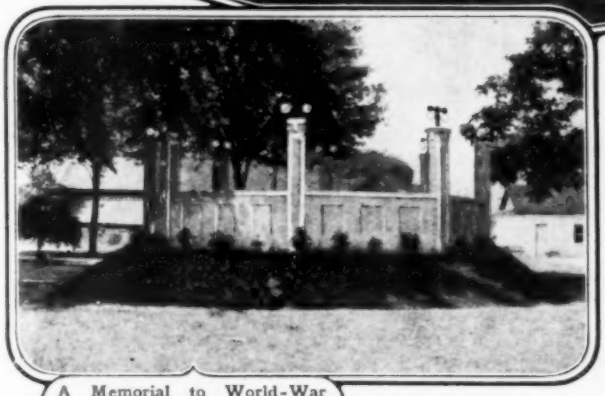
Information Booth for Tourists, Operated by a Boy Scout: A Number of These have been Placed on All the Main Highways Radiating from Grand Rapids, Mich. The Boy Scouts, Who Work Gratis, Distribute Maps of the City and State, and Answer All Questions

A Hedge Made Up of Plants of the Night-Blooming Cereus, Displaying a Mass of the Beautiful Blossoms That Wilt the Moment the Sun Strikes Them: The Photograph was Taken by Long Exposure in the Gray Light of Dawn at Honolulu, Hawaiian Territory

AND ENJOYMENT OF VISITORS AND RESIDENTS

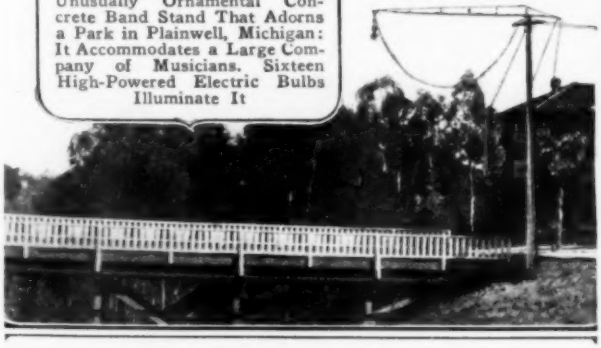
Left: A Community House in Gainesville, Florida, in the Course of Erection by a Company of 176 of the Townspeople Who Volunteered Their Services in the Manner of an Old-Fashioned "Raising Bee." The House was Built in One Day

Right: Community House in Florida That was "Raised" in One Day, as It Looked When It was Finished a Few Days Later. It is Seen Receiving Its Last Finishing Touches



A Memorial to World-War Veterans in the Form of an Unusually Ornamental Concrete Band Stand That Adorns a Park in Plainwell, Michigan: It Accommodates a Large Company of Musicians. Sixteen High-Powered Electric Bulbs Illuminate It

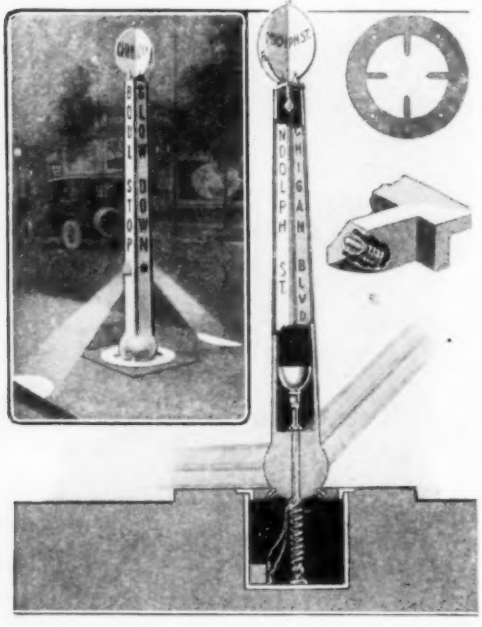
One of Several Wooden Dressing Shelters along the Banks of the Red River, in North Dakota, Which Resembles a Glorified Indian Tepee: It Is Octagonal and is Inclosed to a Height of Eight Feet, with an Umbrellalike Roof Above



This Park Is in San Diego, California, and is Illuminated at Night by the Revolving Light, Seen to the Right, Which, by Means of Its Long Radial Bracket, Lights a Very Large Area as It Moves

TRAFFIC SIGNAL ON SPRINGS CANNOT BE KNOCKED DOWN

The frequent destruction of boulevard crossing lights by motorists has led to the development of a traffic signal on springs.

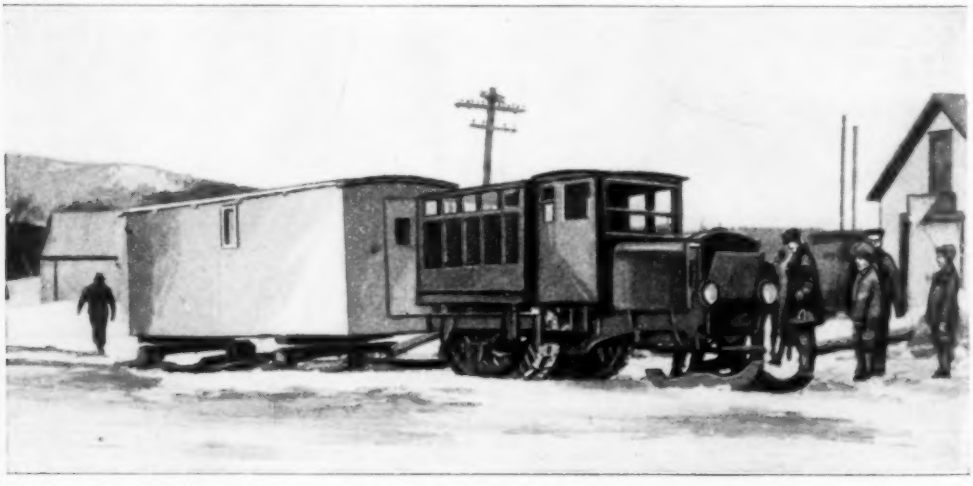


The Safety Traffic Signal as It Appears When Installed: The Diagrams Show the Details of Support, Anchor, Bearings, and Wiring

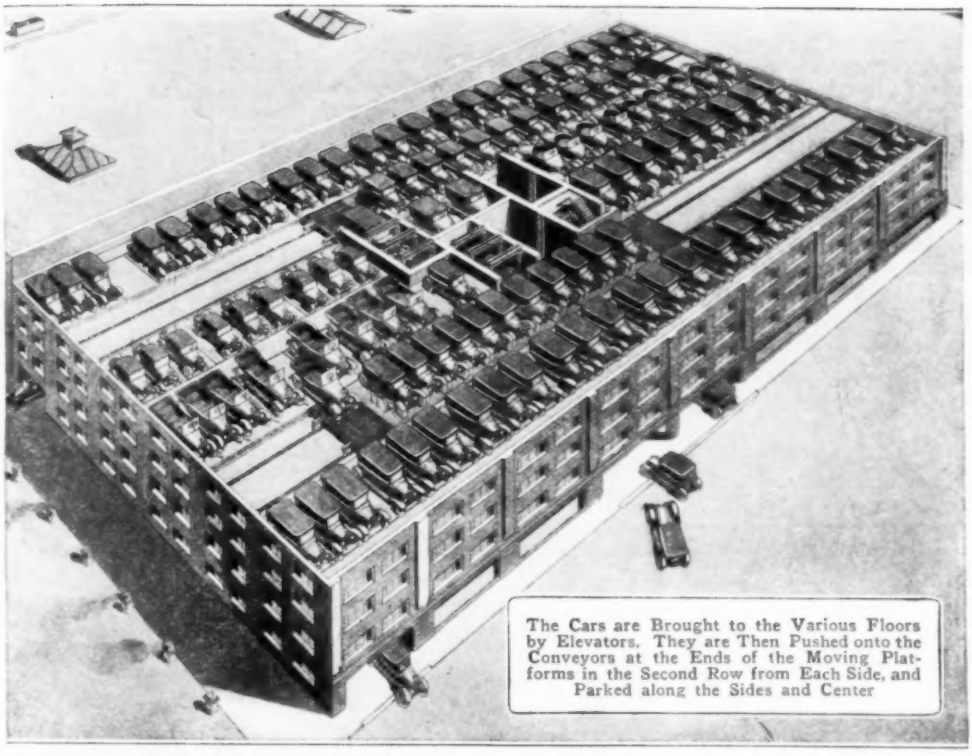
The new signal post stands over a cavity or box set below the surface. At the top of the box are four arms with spring bearings. On these rests a cast-iron ball, 10 in. in diameter. A heavy spiral spring connects a ring at the bottom of the box with another on the ball. The post, which is made of sheet metal, is riveted to the ball. "Slow Down" and "Stop" signs are set into the sides in red glass. Lights inside the pole make it conspicuous at night. Street names appear at the top. When a machine hits the post the spring yields sufficiently to prevent any damage. When pressure is released, the spring pulls the post, uninjured by the collision, back into position.

TRACTOR CARRIES LUMBERMEN TO LOGGING CAMPS

Bitter weather and deep snows last winter influenced one northern Maine lumber company to change the means of transportation between their logging camps and town, from the old-fashioned open sleigh to a modern tractor train. This train consisted of an endless-tread tractor and one box car which was divided into two compartments. The forward end was used for mail and women passengers, while lumberjacks rode in the rear section. The treads of the tractor enabled it to be used in snow of any depth and its front wheels were replaced by runners. Runners also supplanted the wheels under the box car. The cab of the tractor accommodated 12 passengers. The train made the 42-mile trip in one day and returned the next, traveling at the rate of about 10 miles an hour.



Deep Snows and Bitter Weather Last Winter Led One Northern Maine Lumber Company to Adopt This Tractor Train as a Transportation Means between Their Camp and the Nearest Town. Women Passengers and Mail were Carried in the Forward End of the Box Car



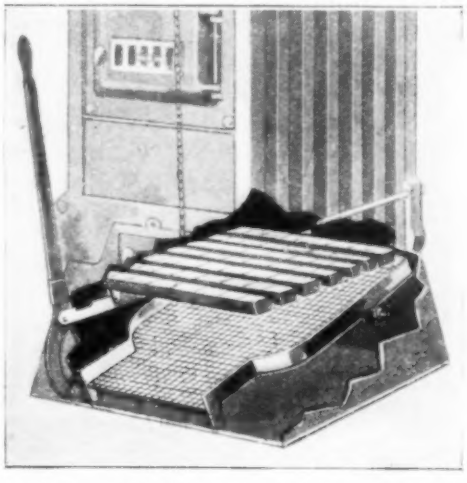
The Cars are Brought to the Various Floors by Elevators. They are Then Pushed onto the Conveyors at the Ends of the Moving Platforms in the Second Row from Each Side, and Parked along the Sides and Center

ELEVATORS AND CONVEYORS OPERATE GARAGE SYSTEM

The garage of the future may be built in the form of a skyscraper, if the principle of elevators and conveyors is successfully applied. The car, properly checked, will be driven onto an elevator at the ground-floor level, the power shut off, and the remainder of the parking operation left to the attendants. In the system, proposed by a Chicago designer, the car is brought to the designated floor where it is pushed from the elevator, by the conveyor floor of the elevator, onto another conveyor at the end of a moving platform. The platform moves until the conveyor is opposite the proper stall, where the car is pushed off. The entire action is completed without using the power of the car.

ASH SIFTER IS COMBINED WITH FURNACE GRATE

A furnace attachment that sifts the ashes while the grate is being shaken is the invention of a New Jersey man. A light, inclined steel frame, covered with ordinary wire mesh, fits into the ash pit. The frame is pivoted on a rod about one-third from the rear and in the center of the height of the pit. Shaking the grate, alternately lifts and drops the sifter through the action of a finger connected to the grate lever and sliding on a standard fixed to the rear of the sifter. The fine particles fall into the pit while the unburned coal gravitates to the front.



The Unburned Coal Falls to the Cellar Floor or into a Receptacle in Front of the Sifter

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

Manicuring is Done Electrically by This Machine. By Holding the Finger Straight toward the Cutter, the Nail will Receive a Perfect Trim, without Risk of Cutting the Finger. There Are Attachments for Polishing

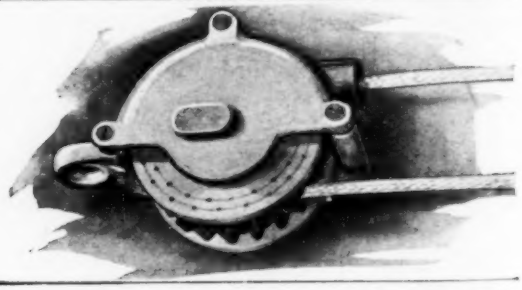
This Comfortable Kitchen Chair of Manifold Uses Has a Right-Hand Table Arm, in Connection with Which Is a Disappearing Drawer. It is Equipped with Four Swivel Casters So That It can be Pushed Around with the Foot

Instrument for Removing Milk-Bottle Stoppers: Its Two Sharp Points Penetrate the Stopper Easily without Pressing It into the Bottle

This Feathered Armlet Is a Parisian Conception, Designed to Cover the Vaccination Mark. It Is a Carved Colored Bracelet with a Curled Ostrich Tip to Match

When Mother has to Do Her Own Auto Driving, This Child Safety Holder Relieves Her of Any Anxiety about Baby, and Leaves Her Hands Free for Steering. The Bag is Strapped to a Rail on the Rear of the Back Seat

A Flat Aluminum Cooky Plate That Exactly Fits Any Oven and Holds More Cookies Than the Ordinary Baking Pans, Which Means a Saving of Fuel



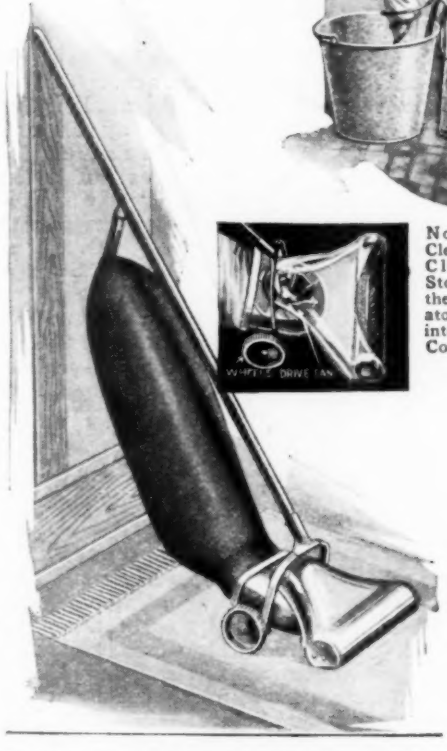
Clothesline Pulley Fitted with Devices for Automatically Removing Any Dust or Dirt That Collects on the Line

This Electric Heater, for Use as a Radiator Heater by being Placed under the Hood of the Auto in Cold Weather, can Also be Used for Other Purposes, Such as Boiling Coffee

Novel Wringer That Cleans and Dries a Mop Cloth without Any Stooping or Soiling of the Hands: The Operator Drops the Cloth into the Inverted Wire Cone and Twists the Mop Handle

Salt and Pepper Shakers Made of Paper Are Inexpensive and Convenient for Packing with Box Lunches or Packages and Hampers Used at Picnics

This Is an Electric Lamp Which Concentrates Its Light upon the Baby "Vamp" Supporting It, and Makes Ways That Are Dark Impossible. The Trimmings Are Silk in Many Colors

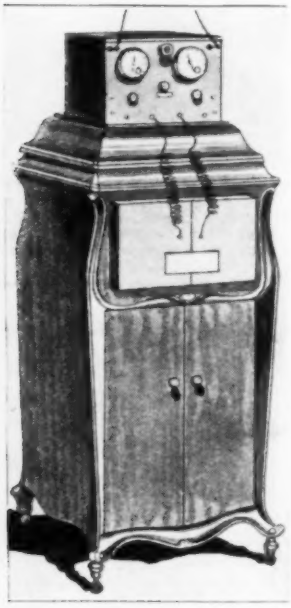


This Nonelectric Vacuum Cleaner Has a Revolving Bristle Brush That Loosens the Dirt Imbedded in a Rug, and a High-Speed Fan Which is Driven by the Rubber-Tired Wheels on Which the Cleaner Rolls, the Fan Providing Suction for Conveying the Dirt to the Bag Above

Utensil for Broiling Meat over Any Open Burner: It Is a Combination Grid and Gravy Pan Which will Cook Meat of Different Thicknesses, Chops, Halves of Poultry, and Also Sausages or Toast. In Operation It is Closed, and Emits No Smoke or Odor

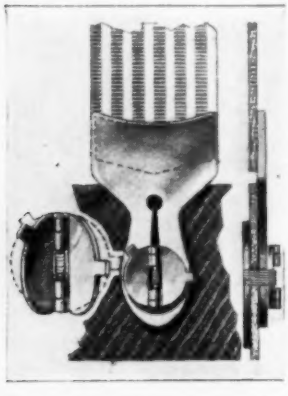
PHONOGRAPH MUSIC BY RADIO IS CLEVER SALES IDEA

A novel sales idea was worked out recently, by a western music house, in which the music of the latest records was transmitted by wireless to the surrounding amateur radio stations. All stations having either crystal or audion detectors were invited by previous advertisement to tune up to 380 meters and call the specified station. A powerful radiophone transmitter, employing two 50-watt vacuum tubes in connection with a phonograph, was then set in operation. After the concert, the circuit was left open for one-half hour, during which time orders for records were received by the music house.



COLLAPSIBLE BUTTON PASSES THROUGH STIFF BUTTONHOLE

If suspenders are to come back into use to any considerable extent, there will be no more tugging and tearing to fasten the buttons through the stiff hole in the leather end. A button which folds up on a hinge at its center, and can be sewed down around its center pin, slides through the narrow slot without any difficulty. The button can also be used with other articles made of stiff material.

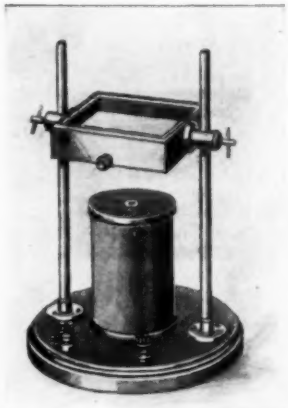


WOOD-SEASONING METHODS TO BE STUDIED

Although air seasoning of wood has long been the accepted treatment, a scientific attempt will soon be made to determine whether or not some changes in the practice will result in greater economies. The study will include the different methods of piling under different climatic conditions, and is expected to settle various important questions, such as whether complete drying at the mill or partial seasoning there and at the point of utilization, is the more advantageous, etc. Another part of the survey will concern the piling of the wood with relation to the direction of wind and yard-alleyway locations. The question of the comparative economy of kiln drying and air seasoning has often been raised. Enough facts will be gathered in the survey, it is thought, to settle this question definitely.

APPARATUS WILL DEMONSTRATE MODERN THEORY OF THE ATOM

By means of an apparatus known as the "model of the atom," an ocular demonstration can be given of the modern theory of the structure of an atom, which assumes one or more electrons in motion in or about a central body, or positive nucleus. The apparatus consists essentially of a coil with an iron core mounted vertically between two rods that support a tray, slidably mounted upon them and fitted with binding posts and electrodes so disposed that, when mercury is placed within the tray, current may be sent through it along radial lines toward or away from the center of the tray. Small steel balls are then placed on the surface of the mercury.

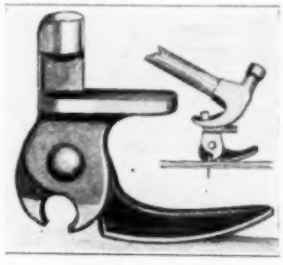


When current is turned on through both the magnet and the tray the mercury rotates, and when balls are on its surface they also rotate, with occasional radiations, relatively in the same manner as the electrons of an atom. The nucleus

of the atom is represented by the center of rotation of the mercury. For operating the apparatus it is possible to use, in combination with a bank of lamps to control the current, an ordinary lighting circuit, or a six-volt storage battery alone.

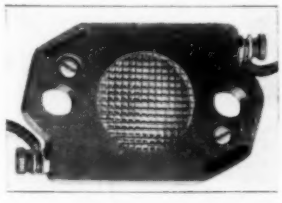
VEST-POCKET NAIL PULLER IS SMALL BUT HANDY

A small-size tool which does a large-size job is the vest-pocket nail puller. All of its parts are made of drop-forged steel, and although it is so small, it has pulled cement-coated nails from knots without difficulty. A claw hammer takes the place of the long lever that is generally seen on nail pullers and also serves as the medium to set the curved nail-gripping claws of the puller. After setting the claws of the puller over the head of the nail sufficiently deep to assure a tight hold, the claws of the hammer slide over an especially shaped head on the puller, and the combined leverage of the pair draws the nail.



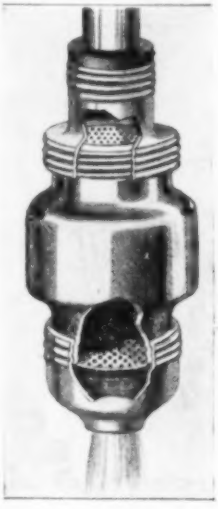
ELECTRIC VAPORIZER MAKES INSTANT STARTING EASY

A new automobile attachment will, it is claimed, make instant starting possible in all kinds of weather, besides saving about 15 per cent in gasoline and reducing consumption of battery current, lubricating oil, and time. A case, made of heat-resisting composition, and holding four wire screens rigidly in a hole in its center, is fastened between the carburetor and the intake manifold. The wires are heated for about 10 seconds before starting the motor, by the current from the car batteries, controlled by a switch on the dashboard. In this way the intake air and sprayed gasoline are preheated so that the starter will give immediate service. The fuel saving is effected through vaporization of the gasoline.



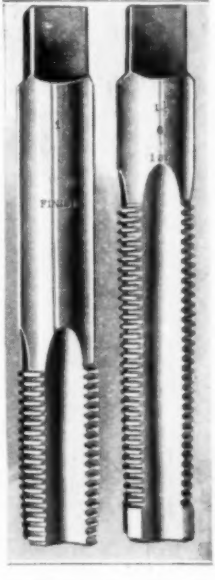
CHARCOAL BATHTUB FILTER RAPID AND EFFECTIVE

An effective filter that can be pushed onto the bathtub faucet, consists of an open glass jar protected by metal screens at both top and bottom, and filled with ground charcoal. A white-enameled metal outlet at the bottom, and a connection of the same material at the top, are screwed to the glass jar. The top connection is fitted with a rubber washer which holds the filter in place. Escape of the fine charcoal is prevented by spreading pieces of linen over the lower screen.



TAP CUTS ON ONE SIDE OF TEETH ONLY

A tap for the threading of holes in steel pieces has the special feature of being relieved on alternate sides of the teeth so that only one side of a tooth does any cutting. The action, therefore, is said to be similar to that of a lathe side-cutting tool rather than of a series of broad-nose cutting tools, as is the common practice. The advantages cited are the reduction in friction and breakage of teeth, with consequent lengthening of the life of the tool. It is made in regular roughing and finishing sizes, and is obtainable with standard as well as special threads. The tap is hardened all over, and the teeth are circular and profile-ground for accuracy. The illustration shows a roughing tap at the right and a finishing tap at the left, the former having a pilot.



MECHANICAL PARTNER FOR DANCING PUPIL

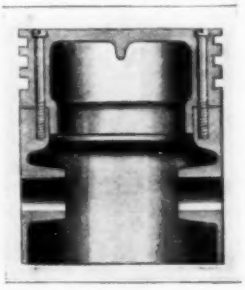
A figure for use in dancing instruction is one of the latest inventions. A strap for the pupil's hand is attached to the back of a figure similar to a clothing dummy. Below this is a plate from which a bar extends back and down, fitting into a tube. The height of the figure may be adjusted by inserting a pin in any of a number of holes in the bar and tube. The tube terminates in a cup which grips a wooden ball in such a way that the ball rotates easily on the floor. A folding leg is provided which supports the figure when not in use but is out of the way of the dancer's feet during practice.

WEATHER GLASS HOLDS OWN AGAINST MODERN BAROMETER

The old Dutch weather glass is still used in England. The device is simply a glass vessel entirely closed except for a fine spout emerging a little below the center. The glass is filled with water to a point just above the opening and hung by a ring at the top. It must not be placed in the direct rays of the sun, near a fire, or where exposed to any draft. Preference is given to rain water for filling the jar. As bad weather becomes likely the water rises in the spout, and on the approach of clear weather it falls; that is, its action is the reverse of a barometer's. This is because the air inclosed in the body of the glass expands when the outer air pressure becomes less, or the "barometer falls," as the expression is, and vice versa. The old-fashioned device has the advantage of being unaffected by the rolling or pitching of a ship or by propeller vibrations, and is therefore still popular among seafaring men.

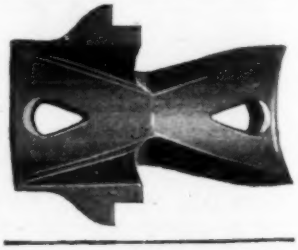
PISTON MADE IN TWO PIECES OF CAST IRON AND ALUMINUM

For use especially in internal-combustion engines, a piston made in two parts of different metals has been patented in this country. The main body of the piston in which the wristpin is mounted is made of cast iron, and the head, forming an extension which is grooved for piston rings, is made of aluminum. The two parts are fitted together on a finished seat and flange, and are then secured with flat-head machine screws. The advantages claimed for this construction are that it is lighter than ordinary cast-iron pistons, and that it can be attended to and repaired without taking it out of the engine. This can be done by removing the cylinder head, making the piston head accessible.



IMPROVED JOURNAL BEARINGS FOR RAILROAD CARS

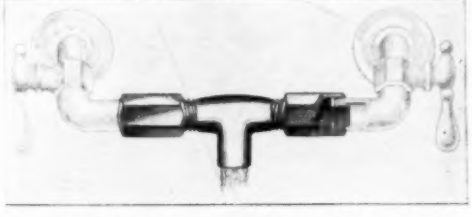
It is generally conceded that the principal cause of hot boxes on railroad-car journals is the tendency, due to centrifugal forces, of deposits of foreign matter to accumulate at the fillet end of the journal, preventing proper lubrication at this point. In order to overcome this disadvantage, and also to add other improvements, a new form of car-journal bearing has been developed by a New Orleans manufacturer. The bearing is interchangeable with the standard bearings, and requires no change in the oil box



or wedge. The bearing is in the form of the letter "X," with its lips so shaped that they overcome the tendency of the lubricating oil to accumulate at the center of the bearing. In the new bearing this oil is carried to the collar and fillet ends, keeping those portions of the journal face always well lubricated. As compared with the standard bearing, it is much lighter, using less brass and more babbitt, and therefore costs less to manufacture.

SINK - FAUCET ATTACHMENT MIXES HOT AND COLD WATER

The temperature of the water from the kitchen sink will be as readily controlled as is that of the bathroom, by the use of a patented plumbing fitting which connects the hot and cold-water faucets. The fitting is essentially a tee with a baffle plate cast in its center, to insure a perfect mixing, regardless of the unequal pressures the water may be under. It is easily installed by turning the two faucets inwardly to a horizontal position, and fastening it by means of two sleeves,



Hot and Cold Water are Combined and Regulated to the Proper Temperature in This Tee. It Screws to Both Faucets and Has Means for Equalizing the Pressures

which screw onto the mixer and are provided with rubber washers at the ends that go over the faucets.

NEW ART BUILDING PLANNED FOR AMSTERDAM

A new art museum to be located behind the present Rijks Museum of Amsterdam, Holland, has been projected. It will house only the greatest and most important works of art, assembled so that the visitor will not have to seek them out among those of less artistic value.

PRESERVING FRUIT IN FRESH STATE FOR MONTHS

To preserve fresh fruit for periods of six months or more, an Argentinean has patented a method for feeding water artificially to the fruit. The method, when applied to grapes, is to insert the ends of the vine stem, cut near the bunch, into two vessels filled with water. The ends

of the vine are held snugly by means of rubber sockets so as to prevent water leakage. The contrivance, fruit and all, is suspended until required for consumption or transportation.

TEACART EQUIPPED WITH STOVE COOKS OR WARMS FOOD

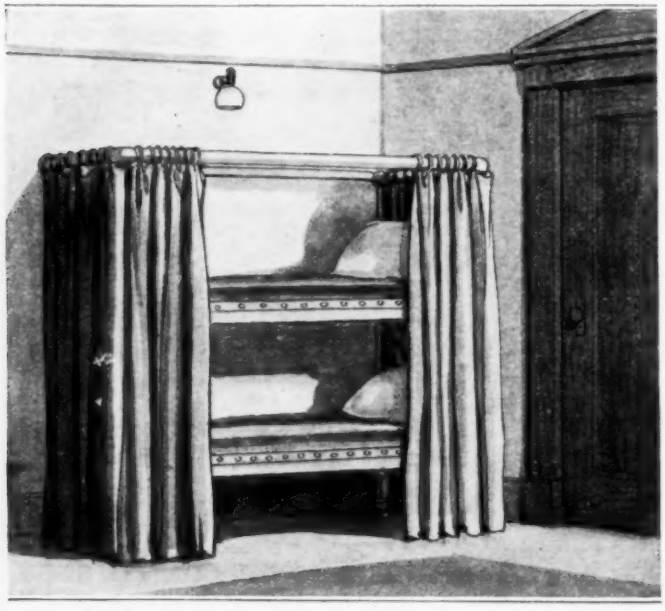
A teacart that carries its own heating apparatus, for either cooking or warming food, can be used for a variety of purposes about the home and nursery. A removable oven is equipped with both an electric and a gas heater ready for connection to the nearest socket or gas outlet. There are also two soapstone disks which can be heated and placed in the oven when only the warming of food,

This Teacart Carries Its Own Heating Apparatus, Which may be Connected to the Handiest Light Socket or Gas Jet. For Milder Heat, Soapstone Disks are Provided

baby's clothes, or the sickroom is needed, the heat being transferred through a hole in the top of the table.

CONVERTIBLE BED FOR JURY ROOMS

In most states the law provides that the members of a jury shall remain in the jury room during the entire period of their deliberations. Since women have been privileged to serve as jurors, mixed juries have become common, and in cases where their retention overnight has been necessary, there has been considerable difficulty in providing accommodation without causing embarrassment between the sexes. The difficulty has now been solved by the adoption of sleeping-car methods. A convertible bed, that may be aptly compared with a lower berth of a section of a sleeping car, has a frame of rods around it, on which curtains are hung that can be opened and closed in exactly the same manner as on a Pullman. Each section is portable, and in the daytime can be used as a lounge. At night it is placed against the wall, with the curtains drawn.



This Double-Deck Bed Is Convertible and has been Designed for Use in Jury Rooms Where Men and Women Jurors are Obliged to Stay All Night. During the Day Its Curtains are Taken Down and the Individual Beds Made into Lounges

BUSHING REMOVER IS HANDY GARAGE TOOL

Stubborn, sticking bushings have wasted more time for the garage man than can be easily computed. Now a tool for removing such parts has been placed on the market which does the work quickly and easily. The tool is tapered and threaded and has a square end for the fitting of a wrench. It is driven into the bushing to be removed and given a couple of turns. When its threads have taken a firm grip in the bushing metal, a few light taps with a hammer on the entry end will remove tool and bushing together without damage to the socket.

By Tapping on the End of This Tool After Its Threads have Taken a Grip in the Bushing Metal, the Bushing will Come Out Easily

NONSPLITTING CHISEL HANDLE IS LATEST FOR WOODWORKERS

Splitting chisel handles have been a source of annoyance and inconvenience to the woodworker for many years. Now comes a handle for the chisel which is made of wood as usual, but which will not split. In a hole bored in the handle for about half its length, a screw slightly smaller than the bore is inserted. The space around it is filled with cement. The head of the screw is countersunk to a level even with the striking surface of the chisel. When a blow is delivered to the chisel head by the driving mallet, the cement filler serves as a cushion and prevents the handle from breaking or splitting as a result of the impact.

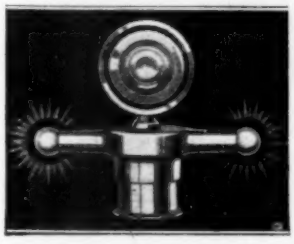
A Nonsplitting Chisel Handle: The Cavity between the Screw and the Bore of the Hole is Filled with Cement, Which Cushions the Driving Blows

EXTRACTION OF PHOSPHORUS FROM ORES BY LEACHING

The value of iron ore is often greatly reduced by too high a percentage of phosphorus, and in some cases the phosphorus content is so high that the ore is unmarketable. Therefore, it would be an important development in the iron-mining industry if some method of treatment could be found for reducing the phosphorus content of the ore. With this object in view a number of experiments have been made by the Bureau of Mines to determine whether it is possible to do this by leaching the iron ores. As the research has a practical as well as a theoretical application, only low concentrations of acids and alkalies were used. The experiments were made with two sizes of ore, 100 and 300-mesh, though all but a few were with 100-mesh ore. It was found that sulphuric acid was the best solvent, while hydrochloric was the poorest. Sodium hydroxide gave the second best results. In these tests not more than 8.2 per cent of the phosphorus was leached out, and the conclusion drawn was that the method is not commercially feasible.

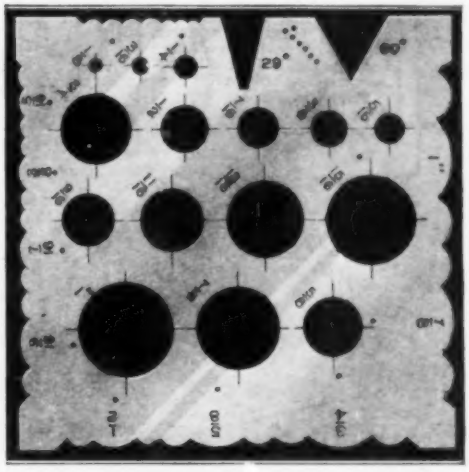
ELECTRIC BULBS DISPLACE KNOBS ON RADIATOR CAP

A bar cap which has two electric bulbs in place of the usual knobs, has been designed to close the water inlet of the automobile radiator. The new cap has many uses, including illumination of the motor meter, furnishing the proper parking light, and providing two handy sockets for service-light connections. Insulating walls protect the bulb wires from contact with the water in the radiator. Bulbs of different colors may, of course, be used.



INSTRUMENT FOR DRAFTSMEN FACILITATES THEIR WORK

Mechanical draftsmen will find some of their most tedious work facilitated by a new instrument which simplifies the drawing of small circles, the outlining of nuts, screw threads, fillets, and also lettering. The instrument is made of celluloid, like a triangular set square, but is square, the sides measuring about 5 in. It is used in combination with a T-square. The center of the circle to be drawn is located



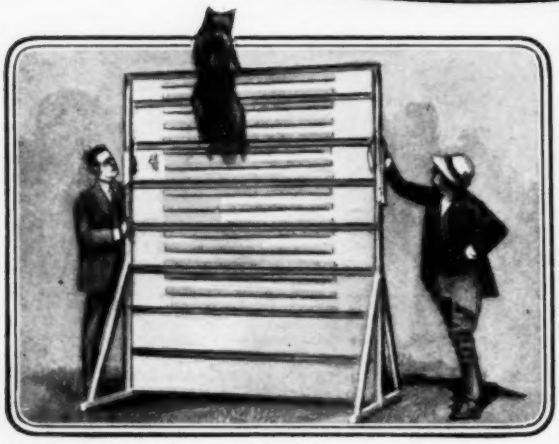
The Holes, Arcs, and Angular Indentations Save the Draftsman Time in Figuring. Their Sizes are Marked on the Disks

by drawing first the vertical and the horizontal diameter and then matching them with lines on the instrument. Around the edges of the instrument are circular arcs of varying radii, the centers being located by small holes, and slopes of different angles for drawing nuts and threads.

MASTER CLOCK IN HOUSE RINGS CHURCH BELL

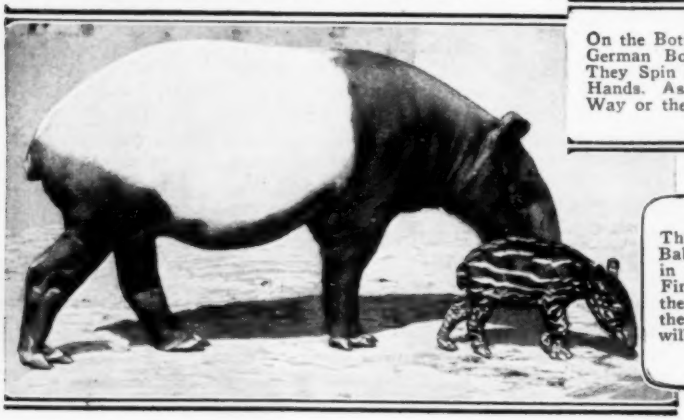
From its sound, and all other obvious indications, the casual visitor to Mooresville, N. C., would suppose the clock in the Presbyterian church of that town to be of the ordinary hour-announcing town-clock variety. This is not true, however, for an ingenious electrical combination is used for striking. In a house near the church, hangs a finely adjusted eight-day clock, whose hour-striking hammer is fitted with a silk cord. This cord, with each backstroke of the hammer, closes a switch which sends current from a battery into a relay. This relay cuts in the village power line and sets into action a motor on the church-tower floor. As the motor armature spins, a pulley on its end winds up a length of belting with a chain attached, which pulls the bell striker. The circuit lasts only as long as the hammer of the master clock is drawn back, and thus the town clock strikes the hour in perfect synchronism with the master mechanism.

This Little Girl is Shown Holding a Doll Which can Sing and Talk without being Squeezed. On Dolly's Inside, Is a Small, Motor-Driven Phonograph, Which Plays a Record. The Little Boy at the Right is Placing One of These Records in His Toy Phonograph, Which Also Plays It



A High Jump for a Shepherd Dog: The Patented Wall is Made Higher after Each Jump of the Dog. The Dog Keeps Right on Jumping as Long as the Height is Increased. This Training Teaches Him to Scale Real Walls

On the Bottom of the Stilts That These Little German Boys are Using, Is a Top, Which They Spin by Turning the Stilts with Their Hands. As the Stilt Handle is Turned One Way or the Other, the Boys Go Forward or Backward



The Streaked Little Animal Is a Baby Malayan Tapir. It was Born in the London Zoo, Recently, the First Ever Born in Captivity. As the Little Creature Grows Older, the Stripes will Disappear, and It will Have a White Saddle on Its Back, Like Its Mother

Boys in the Neighborhood of 175th Street and Fulton Avenue, New York, have Built the Toboggan Shown in the Picture Above. The Track Part is Made of Waste Lumber, and the Car, a Flat Boatlike Affair, Has Roller-Skate Wheels for Casters

The Body Part of This Top Is a Small Geographical Globe. The Child Delights in Watching the Top Spin, and When It Stops He will Watch Eagerly Which Country Is on Top

At the Opening of the Pilgrim Tercentenary Celebration Held at Plymouth, Massachusetts, Recently, Some Very Interesting Silver Medals were Presented by President Harding. They were Awarded to New Bedford, Massachusetts, School Children, Born of Parents Who could Not Speak English, for Proficiency in the English Language. The Medals Are Elliptical in Shape, Beautifully Engraved, and Inscribed with the Reason of the Award, and the Name of the Donor, a Bedford Newspaper. The Picture at the Left Shows the Two Sides of the Medal

LATEST DEVELOPMENTS IN SCIENTIFIC RESEARCH

By C. A. BRIGGS

SCIENCE GIVES HOPE OF DEVELOPING A REAL DIVINING ROD

The history of the divining rod, by means of which water and minerals are reputed to have been discovered, is old. Even lately descriptions and discussions of these devices have been such as to lead many to believe that there was a scientific basis for their action. Such is not the case. The twisting of a crooked stick, or in some later forms, the action of various mechanisms, has been attributed to forces produced by the object of the search, although tests in the laboratory or with scientific apparatus a million times as sensitive fail to disclose their existence.

Recently, however, there has been a proposal to use one form of a sensitive scientific apparatus, known as an Eötvös balance, for purposes similar to a divining rod, the idea of which has some reasonable foundation. This apparatus is used in measuring differences in gravity. Imagine a filament of quartz of extreme fineness, fastened at one end, and at the other connected to the middle of a short, light rod carrying at one end a small weight, which is balanced by an equal load suspended from the other end by a second length of fine quartz thread. Such is substantially the construction of the balance. This is mounted in a suitable case equipped with auxiliary parts for adjustments, and by means of which any rotation of the system about its suspending fiber can be accurately determined. This instrument, when properly made, adjusted, and in skilled hands, is capable of detecting and measuring the extremely small difference in gravity at two points a short distance apart horizontally. By its use has been demonstrated the existence of local irregularities in gravity which may be produced in objects in the neighborhood. For instance, in the laboratory test of such a device, a long cellar under one side of the building appeared to have a repulsive force which produced a strong effect upon the sensitive arrangement.

Coal is very much less dense than the rocks in which it is found. This has its effect on the gravitational field of the earth near by. It is proposed to use this balance to determine whether the coal in the earth will disclose its presence by characteristic effects on the action of the balance. The Coast and Geodetic Survey was recently requested to furnish an explanatory theory of the action of this device by persons planning to use it in discovering the location of salt deposits. If after a thorough trial it proves a practical means for locating minerals or ores, the first real divining rod will have been found.

NO BALLOON TRIP COMPLETE WITHOUT A SLIDE RULE

Many of us have read stories of ballooning which proceeded on a conventional plan. At some stage of the journey the balloon descended to such a low level that ballast was thrown out with the result that the balloon shot up so high that it was necessary to let gas escape. The balloon would respond so faithfully to this that it was necessary again to throw out more ballast, and in this manner the balloon continued a wild and oscillatory career, until the basket was cut loose, and the adventurer was rescued by a remarkable series of events to become the hero of his tale.

This type of adventure has been rendered obsolete by a form of slide rule invented for balloonists by the Bureau of Standards. With this new device, the setting of a slide and the reading of a scale tells the pilot how much ballast to discharge to rise a definite amount, or how much gas should be released to drop to a certain level below. While the rule is simple in appearance, there seems to be no practical problem in balloon navigation that cannot be readily and promptly solved with its aid. If the gas is not pure, this fact is taken account of in the computation; the lifting power of the ship for a given set of conditions can be computed in advance; the effect of loss of gas from its expansion beyond the volume of the envelope when high altitudes are reached can be allowed for, and the influence of sunshine and the changes of temperature can be quickly calculated and taken into immediate account. Thus, for those who guide the destiny of balloons, does calculation supplant inspiration, which, while less romantic from the ground, contributes to comfort and security high in air.

REVOLUTIONARY FORM OF FURNACE GIVES STRIKING RESULTS

One of the recent useful scientific developments has been an entirely new form of electric furnace, the history and action of which are of particular interest. A scientist, considering the furnace question, pondered on the great desirability of getting a means whereby the heat would be generated in the bodies whose temperature was to be raised, and not, as was previously the case, have to be brought in from the outside. By a series of logical steps he conceived a form of electric furnace in which he accomplished his object, and the resulting device has not only proved very practical but one which has been found to possess many features of peculiar interest.

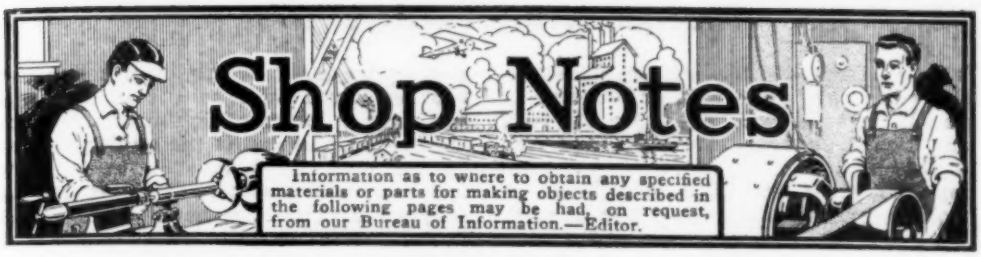
The new apparatus is known as an induction furnace. Primarily it consists of a helix of wire through which a high-frequency alternating current is passed. This produces a magnetic field in the coil which is made and unmade with tremendous rapidity, and sets up eddy or induced currents in any conducting material placed in the coil; and these currents are sufficient to raise the temperature quickly, and in a few seconds melt any of the ordinary metals. A small piece of platinum, one of the most refractory metals, weighing 1½ grams can be melted in 30 seconds; and larger specimens heat more quickly. The significance of this statement will be appreciated by those who have attempted to melt platinum.

The high-frequency currents employed are produced by precisely the same scheme as is used in sending out radio waves. Ordinarily the frequency of the furnace current is from 12,000 to 25,000 cycles per second, which corresponds to radio wave lengths of 25,000 and 12,000 kilometers respectively. A small portion of this is radiated from the furnace, and also is accompanied with what corresponds in music to overtones, which yield short wave lengths. In one of our scientific institutions the mere mention in the radio section of an electric induction furnace is sufficient to cause the members of the staff to register acute distress. They claim furnaces in near-by laboratories have interfered with their delicate radio apparatus.

The coil in which the magnetic field is produced is composed of a hollow copper tube through which water is circulated to prevent heating. One such furnace consists of 36 turns of ⅛-in. copper tubing in a coil about 4 in. long, with an inner diameter of about an inch or an inch and a quarter. Larger coils are in use for the industrial melting of rare metals and special alloys.

The most rapid heating of any object takes place when it is in a position to intercept the greatest magnetic field. A copper coin was dropped into the small coil mentioned above and rested partly in a small crucible. When the current was turned on, the coin turned resolutely edge upward, and while it became hot this was not perceptible to the eye. It was then forced over so that its plane was perpendicular to the axis of the coil, and the increase in the induced current caused the coin to heat rapidly and melt. While the forces acting on the object heated are not great, they may be sufficient to throw a disk of aluminum, and sometimes a platinum crucible, out of the coil. Under certain conditions a platinum crucible may float about in the coil. In melted objects a vigorous stirring takes place, and molten aluminum will be stacked up in the center. The iron cores of the familiar electric transformer are laminated to reduce the energy loss caused by eddy currents heating the material. Making use of the same principle, it is possible to melt tungsten, one of the most refractory of substances, by holding a piece of the metal in a crucible of the same material in a powdered form. The small size of the granules forming the crucible reduces the heat generated in them so that the heat is localized in the specimen. A person can stick his finger down the coil, otherwise empty, without any noticeable effect, but, as determined by one experimenter to his grief, when a ring is present on the finger it is not possible to stick in the finger and remove it quickly enough not to be burned.

With this furnace there is no upper limit of temperature yet apparent. One particular advantage of this form is that it is easy to surround the charge with any desired atmosphere, as, for instance, a reducing gas to prevent oxidation.

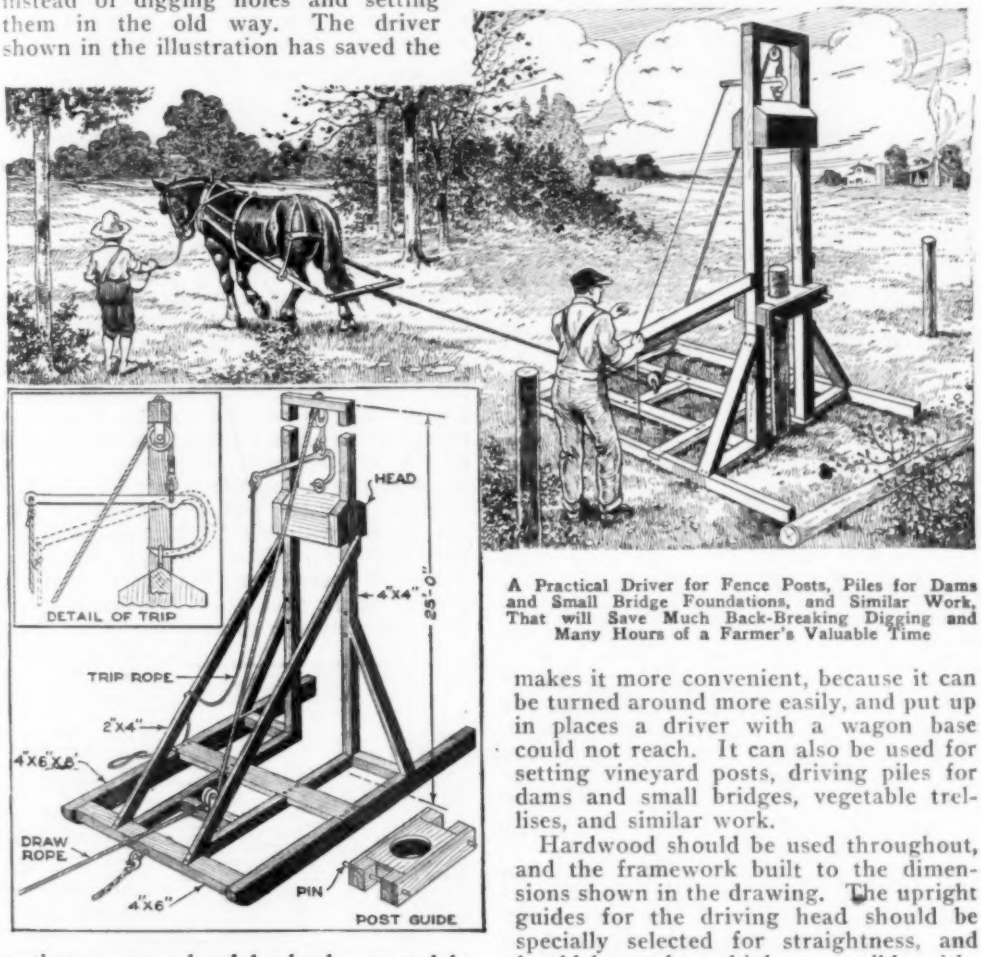

Shop Notes
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

A Practical Homemade Post Driver

By R. B. RUSHING

NEARLY every farmer has a number of fence posts to set every season, and unless the farm is over a substratum of rock, these might just as well be driven instead of digging holes and setting them in the old way. The driver shown in the illustration has saved the author many a hard backache caused by digging post holes.

With a driver of this type, the weight, or head, is drawn up by the horse used to pull the driver from place to place, and is heavy enough to drive a post to the proper depth with from two to four blows, according to the soil. Mounting the driver on skids instead of wheels, makes it more convenient, because it can be turned around more easily, and put up in places a driver with a wagon base could not reach. It can also be used for setting vineyard posts, driving piles for dams and small bridges, vegetable trellises, and similar work.



A Practical Driver for Fence Posts, Piles for Dams and Small Bridge Foundations, and Similar Work, That will Save Much Back-Breaking Digging and Many Hours of a Farmer's Valuable Time

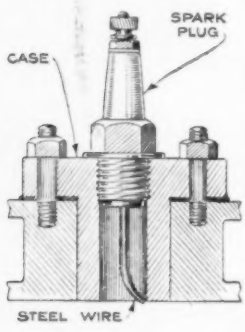
Hardwood should be used throughout, and the framework built to the dimensions shown in the drawing. The upright guides for the driving head should be specially selected for straightness, and should be made as high as possible without making the driver top-heavy. The height shown, 25 ft., will serve for most soils, but the higher the guides the harder the blow on the post. The head itself is

built up from the heaviest wood obtainable—live oak, white oak, or hickory. If possible, a solid piece, 2½ ft. by 3 ft. long and almost as wide, should be used, and if desired, the block can be cut out on top and the space filled with lead. A molded concrete block could also be used, in which case its dimensions need not be so large as for the wooden head. A groove is cut in each end of the head, wide enough to fit over the guides without binding. Two pulleys are needed, and these are attached to the frame as shown. The trip lever is one of the most important parts of the driver and can be made at slight expense by any blacksmith, from a piece of old wagon tire. A small rope is attached to the end of the lever for tripping the weight when it has been elevated to the proper distance. Another part of the driver that is quite important is the post guide, as this insures that the post is driven straight. It is made up and used as indicated in the drawing, being held in position on the guides by pins inserted through holes. After the post has been well started, the guide can be dropped if desired, although if the holes in the guides are so placed that the post is driven to the proper depth when its top is still an inch or two above the post guide, the moving of the latter is not necessary. In driving the posts, the lower ends are slightly sharpened, just enough to make them stand, and the first heavy blow will start them straight.

Any handy man can build the driver in a few hours, and if he does not consider that he has sufficient work to justify the expense, it might be possible to arrange with two or three others to pool the cost, which, at most, will be slight.

High-Tension Ignition for Old Gas Engine

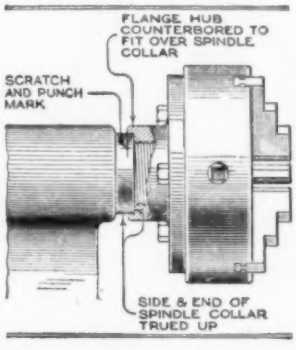
Many owners of gas engines have experienced difficulty in obtaining repair parts for old engines; this is particularly true of engines equipped with make-and-break ignition. In such a case, the jump-spark or high-tension system may be installed in an engine of this type with good results.



The case that holds the make-and-break mechanism and the rocker arm are removed, and the projection that holds the arm to the other point is then cut off. Then the hole in the case is reamed out and tapped to accommodate a standard spark plug. In most instances, this hole is so long that the plug is in a pocket, which makes ignition rather uncertain. This difficulty may be overcome by welding a piece of steel wire to the center electrode of the spark plug, and bending it, as indicated in the illustration, so that there will be a gap between it and the wall of the case. The plug should be inserted and the point adjusted to obtain the proper gap before the case is placed in the cylinder. The mechanism that formerly operated the rocker arm can be easily redesigned to serve as a timer for the new system. A vibrator-type induction coil will be required instead of the one used with the discarded system.—S. E. Gibbs, Ames, Ia.

Making a Universal Chuck Run True

Even when new, a universal lathe chuck sometimes refuses to center its work accurately, although the fault is usually found in the manner of mounting on the lathe spindle rather than in the chuck itself. The usual way is to bore and thread a cast-iron flange, face up the end of the hub, screw it on the lathe-spindle nose, and machine the face of the flange to take the chuck body. The accuracy of the chuck will depend principally upon that of the threads of the lathe nose and flange; if there is any looseness, or if the threads wear, the flange will never screw on in exactly the same place every time, and the chuck jaws will be thrown out of true.



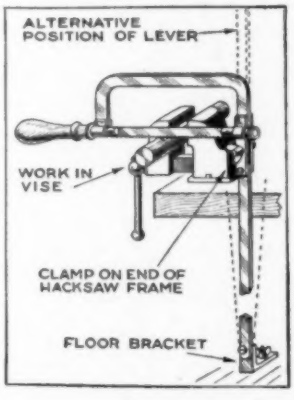
The drawing shows a way to improve the mounting by using a flange, the hub of which is of larger diameter than the spindle collar. This collar is first trued all over by taking a very light cut, making sure that the spindle bearings

are without play. Then the flange casting is clamped in a chuck, hub out, bored, and threaded—a slight looseness in the threads being desirable in this case to permit the flange to "float"—and is then counterbored from ⅛ to ¼ in. deep so as to make a tight fit over the spindle collar. Prussian blue may be applied to the collar before screwing on the flange, in order to make sure that it screws all the way on and makes contact with the end of the collar; the collar may be turned down a trifle more if necessary. When it is screwed all the way home, the flange face may be machined to take the chuck. A prick mark and scratch is made on the collar at the edge of the flange and another on the flange opposite the mark; these will indicate when the chuck is screwed home.

It will be seen that this method allows a more accurate setting of the chuck, as the counterbore always registers with the collar, provided the surfaces are cleaned beforehand, and no dependence is placed upon the threads except for holding the chuck on the spindle.

A Hacksaw Attachment

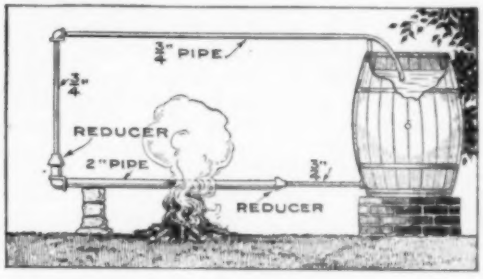
The drawing shows a little device that is of considerable assistance when sawing with a hand hacksaw. A clamp is made of flat steel or iron, shaped to fit the front end of the hacksaw frame, and attached to it by means of a bolt and wing-nut. A light lever of iron or hardwood is fastened to the lower end of the clamp and extends down to the floor, or at least 2 ft. below the vise jaws; or the lever may be extended above the saw frame and pivoted to the ceiling or to a wall bracket. By using this attachment one or both hands can be used on the saw handle, as the saw will be steadied and the fatigue of sawing lessened.



¶A British thermal unit (B.t.u.) is the quantity of heat required to raise the temperature of 1 lb. of water at 62° F. to 63 degrees.

An Outdoor Hot-Water Supply

To minimize the risk of freezing when mixing concrete in cold weather, and for other purposes where a supply of hot water is needed, and the usual means of producing it are either inadequate or unavailable, the arrangement shown in the drawing, which can be provided at small cost, will prove useful.



A Water-Heating System for Outdoors or Where the Usual Facilities for Heating Water in Quantities Are Inadequate or Unavailable

An ordinary tight barrel is supported above the ground, and the piping system shown connected to it at the bottom. The outer end of the pipe is supported above the surface, and a fire is built underneath the large section. The other end of the pipe is bent inside the barrel, which is kept filled with water. Operating on the thermo-siphon principle, the cooler water in the bottom pipe is heated and as it becomes lighter with the increase in temperature, is forced out through the upper end of the pipe, setting up a continuous circulation.—Chas. L. Dugan, Coalport, Pa.

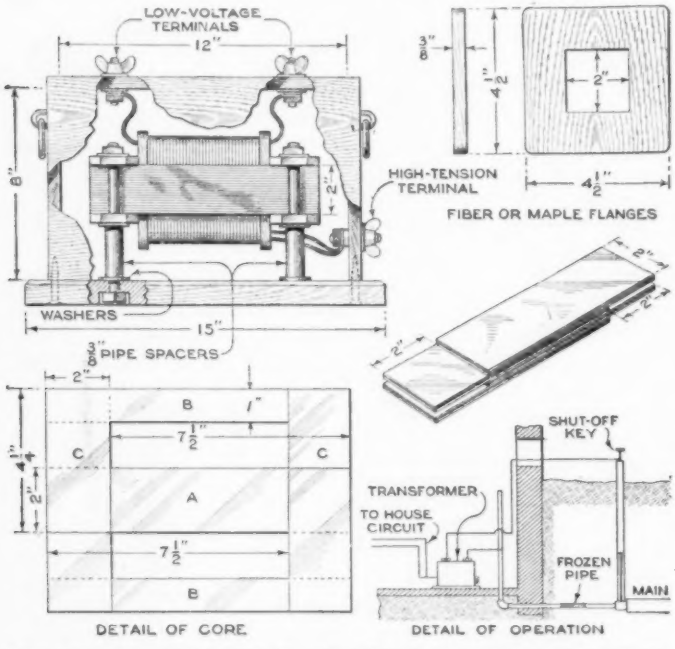
Valve Stem in Gas-Tank Cap

The frequent difficulty of automobile owners with clogged fuel lines from the gasoline tank to the carburetor, has caused a service station to devise a handy little instrument for blowing out the obstruction with air pressure. An ordinary tank cap has a hole drilled at its center, and a tire valve is soldered in place. In use, the cap with the valve is screwed on in place of the regular cap, and about 4 lb. of air pressure is pumped into the tank with an ordinary tire pump, after the end of the fuel pipe has been disconnected from the carburetor or vacuum tank. The obstruction is blown out and the air pressure is maintained for a few seconds, to blow the pipe clean. Only a few sizes of tank caps are required to handle practically any make of car.—G. A. Luers, Washington, D. C.

Thawing Frozen Pipes Electrically

By A. H. SCOTT

IN parts of the country where every cold snap is the cause of many frozen water pipes, the small shop derives considerable income from thawing them, even by the old blowtorch method. The ideal method of thawing frozen pipes, however, is by electricity, but the apparatus usually sold for this purpose is so expensive, and in some cases so cumbersome, that only the municipality can afford the investment in an outfit, which, of necessity, is idle for the greater part of the year.



If the Proprietor of the Small Plumbing Shop is Equipped with This Outfit, He will Be Ready to Handle Pipe-Thawing Jobs with Less Work Than by Means of a Blowtorch

It is possible, however, with no special tools or equipment, to make an outfit that will thaw a pipe in from 15 to 30 minutes, by connecting it to the ordinary house-lighting circuit. The apparatus is nothing more than a transformer of 1½-kw. capacity, designed to operate on a 110-volt, 60-cycle circuit, and includes sufficient cable to make the necessary connections inside and outside the house.

The apparatus described has been designed with a view to cheapness and ruggedness, the electrical parts being so designed that a comparatively large amount of cheap iron is required, while but little copper wire, which is expensive, is needed. The completed transformer is approximately 10 by 15 in., and weighs 38 lb., so that, being provided with handles, it can easily be carried.

A quantity of black stovepipe iron, about 24 lb., will be needed for making a core and laminations of the dimensions given in the drawing. The central part, or core, on which the wire is wound, is first assembled, with the laminations in sets of three, the alternate ends of each set overlapping 2 in. This built-up section, which should be 2 in. square, must be securely bound together with ordinary friction tape and further held together by driving on tight-fitting maple or hard-fiber flanges. If the flanges are made of wood, they should be boiled in paraffin to render them waterproof.

The low-voltage winding, which is to deliver the current that flows through the frozen pipe, is now wound on; this winding consists of 19 turns of No. 10 gauge copper wire, ½ lb. of double cotton-covered wire being needed. This will only half fill the spaces between the flanges if wound on alone, but the wire should be wound on parallel with some ⅛-in. cord, which will space the conductor evenly and aid in forming a good supporting surface for the high-voltage winding. The ends of the winding should be brought through holes in the flanges, so that they can be bent to the terminals which are located in the top of the outfit. Two layers of heavy wrapping paper which has previously been dipped in hot paraffin, are wound on, and this is held in place with a layer of friction tape.

For the high-voltage winding, which is to connect with the house-lighting circuit, 1 lb. of No. 18 gauge annunciator wire, such as used for wiring doorbells, will be needed. This winding consists of 115 turns and occupies four layers, while between each layer there is placed a single thickness of paraffined paper to form

a smooth winding surface and minimize the possibility of electrical failure between the layers. It will be noted that the ends of this winding are passed through holes in the same flange.

The magnetic circuit is completed by assembling the remaining laminations in sets of three, and arranging them in the manner shown in the drawing, small pieces being used in filling the gaps left at the four corners of the core.

The assembly should now be clamped with ¼ by 2 by 7¼-in. iron clamps, which are drilled at the ends to take 5/16-in. bolts, about 5½ in. long. A spacer on each bolt, underneath the bottom half of the clamp, serves to make the bolts support and clamp the core when the nuts are tightened up.

The base is a 9 by 15-in. piece of ⅞-in. oak or maple. A strong box of ¾-in. stock should be made, of the dimensions given in the drawing, with the top and one side drilled to accommodate the terminals used for the low and high-voltage connections. If the bolts used for these terminals are of iron, they should be at least ¼ in. in diameter, and if of brass, not smaller than the wire used on the secondary wiring, and preferably larger.

The high-voltage leads are brought to a pair of terminals on the end of the box; the line to the lighting socket is attached to these terminals. About 25 ft. of lamp cord, with a standard plug attached to one end, and a pair of cables, one about 40 ft. and the other about 5 ft. long, should be provided. These cables should be standard No. 6 gauge rubber-covered wire.

The procedure in thawing a frozen pipe line is to insert a shut-off key at the point outside where the main is tapped. The long lead is connected to this, while the other is clamped to the pipe inside the basement, as indicated in the diagram. When the current is turned on, about 80 amperes will flow through the pipe, which will become sufficiently warmed, in from 15 to 30 minutes, to melt the ice. When the freeze is at some point within the house the lines are simply clamped along the pipe, about 4 ft. apart, allowing the current to flow for about 15 minutes and then shifting one line about 4 ft. farther along, until the frozen part is located and thawed. The faucet should be left open during the thawing operations.

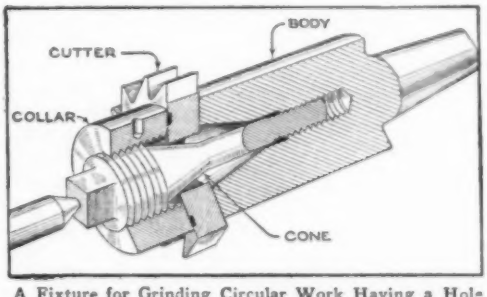
Before connecting the transformer to the house circuit, it should be ascertained that fuses of at least 20 amperes' capacity are in the circuit at the point of entry.

A Convenient Grinding Arbor

A handy fixture for grinding the outside diameter of milling cutters, or the periphery of any circular work having a hole through the center, is shown in the illustration, reference to which will indicate that the device does away with different sizes of arbors or bushings. The fixture will take any size of work within its capacity of from ½ to 1 inch.

A shank is turned on the body to fit the grinder, or it can be turned straight to fit into a chuck, and is drilled and tapped to take the cone, the small threaded end of which is ½ in. in diameter, and as much as possible of this part is left plain to hold it true. The larger diameter of the cone is threaded with 24 threads to the inch, and a collar provided to fit. Two spanner holes in the collar are provided to draw it tightly against the work, the end of the cone being squared for the same purpose and provided with a center hole.

In use, work having a ½-in. hole through the center will fit on the straight shank of the cone, which is first turned down tight against the work, and the collar then tightened against the face, while work with a center-hole diameter of any size up to that of the larger cone diameter will also be automatically centered.—Harry Moore, Montreal Que.



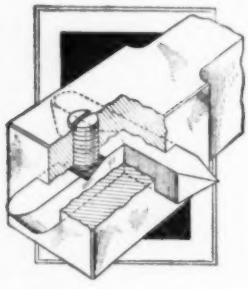
A Fixture for Grinding Circular Work Having a Hole through the Center, Such as Milling Cutters, Which Automatically Adjusts Itself to Take Work Having Holes of Different Sizes

Consistency of Concrete Mixtures

For most construction, concrete should be of a "quaky" consistency; this means that, when placed in a pile, it will gradually spread out or flatten of its own weight. If more water than is required to produce such a mixture is used, the cement-sand mortar and pebbles will likely separate, resulting in porous pockets in the construction.

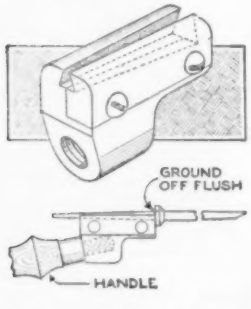
A Combination Lathe Tool

The use of a combination lathe tool, such as shown in the drawing, will be found possible in many lathe operations, and as it does away with considerable changing of tools, it can properly be regarded as a timesaver. In boring, facing, and threading work with a "through" hole, that is, not up to a shoulder, this tool is well worth the little labor of making it. It will be noted from the drawing that the boring and threading are done with the same tool, which is ground at both ends to suit, the cutting edge of the boring end being inverted. The facing tool in the end of the holder has a V-shaped end that fits into a corresponding notch cut in the side of the other tool. The pointed end of the hardened tightening screw bears against a tapered surface cut into the top of the facing tool, forcing the latter into close contact with the second tool, and thus tightening both cutters at the same time.



An Offset Gouge and Chisel Handle

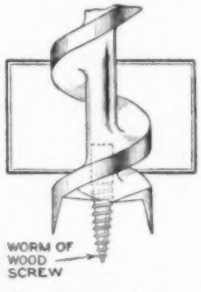
The drawing shows a holder for gouges and chisels that is suited to the needs of all woodworkers and carvers, but more particularly it meets the requirements of the patternmaker for a tool that will enable him to get into long core boxes and to work across broad surfaces. A handle of this sort will take the place of the usual gooseneck gouge as it is to be used with ordinary chisels and gouges. All that is necessary is to remove the wooden handle, grind the shoulder on the chisel as shown, and insert it into the holder, where it is held firmly by tightening the two screws on the side.



The holder is a brass casting made in two pieces. One part has two threaded holes corresponding to the two holes in the other part, the holes in the latter being a trifle larger in diameter to allow for different angles in the tangs of various chisels. The clamping members are slightly beveled so as to take a secure grip on the tang of the tools used in it. The offset is drilled and threaded to take the handle, and by extending it for the length of the holder and providing three holes for the handle, three different positions can be obtained. The holder can also be machined from solid stock.—Chas. Peebles, Yonkers, New York.

Replacing Worm of a Broken Bit

When the worm of an auger or bit is broken off, or worn so that it will not draw the cutting edges into the wood, it is practically useless and is generally thrown away. However, a new worm can be inserted and the tool restored to usefulness.



File or grind off the old worm, as close to the cutting edges as possible, then drill a hole of suitable depth and diameter into the shaft. A woodscrew of nearly the same diameter as the hole is cut to the proper length; the hole is then filled with hot solder, and the screw carefully inserted and centered, allowing enough of it to extend beyond the cutters to draw the bit into the work.

Why Gauge Glasses Break

The manner in which boiler gauge glasses are packed and alined causes much of the trouble experienced with breakage of the glasses. The alinement should be tested by placing a round bar of iron, turned to the size of the bushings, through the fittings. A new gauge glass should have a diameter of not less than $\frac{3}{64}$ in. less than the bore of the gland nut and bushing, and an allowance of at least $\frac{1}{8}$ in. should be made at the end for linear expansion, being careful, however, to see that the glass is long enough to keep the packing from being forced over the end and forming an obstruction in the tube or its fittings. With the fittings in good alinement and the glands properly packed, sufficiently tight joints should be obtained by screwing up the gland nuts by hand, or at least with very little use of the wrench. If the glass tube cannot

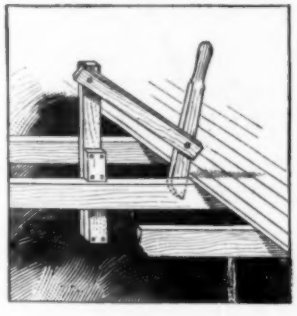
be turned with comparative ease with the fingers and thumb, after the gland nuts have been set pressure-tight, it can usually be taken for granted that the glands have been improperly packed or that the fittings are out of line.

Drawing Radial Lines

When it is necessary to draw a number of lines from a common center, it is usually a matter of more or less difficulty to keep them accurately centered. If, however, a pin is stuck in the center from which the lines radiate, and the edge of the straightedge or triangle is kept bearing against this perpendicular center, it is a very simple matter to rule off perfect radial lines.—N. Sakata, Tokyo, Japan.

An Improved Flooring Clamp

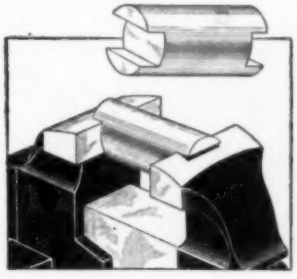
In the laying of tongue-and-groove or matched flooring, it is often difficult to bring the joints together on account of slight warping or improper fitting of the groove. It is the custom of many carpenters to nail blocks upon the joists as they proceed, using them as the fulcrum for a lever to pry the boards into place. The drawing shows a simple and efficient tool that may be made from materials on the job, and that will obviate the necessity for the bothersome blocks as well as make the work much easier.



Two pieces of 2 by 4-in. material, 2 ft. long, and a third piece, 3 ft. long, which is dressed for the handle, are assembled as indicated. Upon the perpendicular piece, two 2 by 4 by 6-in. blocks are nailed or bolted, spaced apart just a trifle more than the width of the joist. In operation, the clamp is placed on one of the joists in the position shown, with the lever bearing against the board. By pushing forward on the lever sufficient pressure is exerted to force the tongue and groove together, the blocks binding the upright piece to the joist. The tool can be moved along the joist or from one joist to another without need of nailing it at any point.—G. E. Hendrickson, Argyle, Wis.

A Handy Vise Block

It is often very convenient, in the shop or garage, to have a curved surface to work upon for such jobs as relining brake bands, bending rod, etc.; and in such cases the vise block illustrated proves its worth. It can be clamped in the vise quickly and removed with equal ease. The block is machined from a cast cylinder or piece of shafting of large diameter. If the surface is rough, it is smoothed off in the lathe, taking a light cut. A slot, sufficiently wide to slip over the vise jaws, is milled into each end; a more convenient working surface, for some purposes, will be obtained if these slots are cut off center.—Lowell R. Butcher, Newton, Ia.

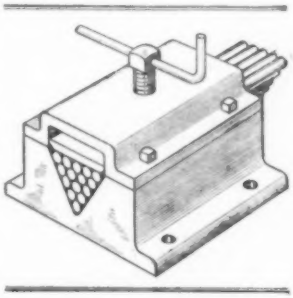


Finishing Concrete Pavements

Floors such as feeding floors and barnyard pavements should be finished with a wood float instead of a steel trowel. This will produce an even but sufficiently rough surface to make a nonslippery floor.

Multiple Cut-Off Fixture

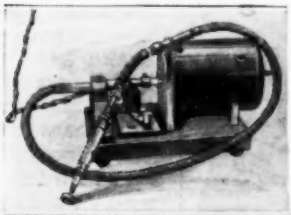
The drawing shows a fixture for cut-off saws and wheels that makes it possible to cut off a large number of pieces at once rather than the single piece accommodated by the clamp, or vise, generally used when round or tubular stock is to be cut into uniform lengths. For machinery or other manufacturing operations requiring short pieces, this fixture will prove of value.



A cast-iron or steel V-block is machined as shown, so as to be conveniently bolted to the machine, the stock being securely held in place and prevented from moving by the clamping plate and hand screw.

A Motor-Driven Eraser for Draftsmen

A mechanical ink eraser, operated by a flexible shaft and driven by a small electric motor, makes it possible to make extensive erasures on drawings with a minimum of effort.



A Motor-Driven Eraser for the Drafting Room Made from the Electric Motor of an Old Dictating Machine with a Flexible Shaft and Holder from a Dentist's "Engine"

The instrument shown in the photographs is made from the electric motor of an old dictating machine, while the flexible shaft and holder are parts of an old dental "engine," as dentists are wont to call their drilling and grinding apparatus. The whole is supported on a hardwood block together with a suitable switch for starting and stopping.

Removal of Glue Stains

Casein and vegetable glues containing caustic soda produce stains on certain kinds of wood, notably the oaks, maple, cherry, elm, ash, birch, and beech. Some glues stain the wood more than others, and those that contain the most alkali are likely to be the most injurious. The staining is due to the action of the alkali in the glue on the tannins and other constituents of the wood, whereby a substance related to ink is formed. Although no means have yet been found of preventing this chemical action, precautions can be taken which will keep the discoloration from the finished surface.

The most trouble with glue stain in woodworking is caused by the penetration of the glue solution through thin face veneers. This seepage is very likely to occur if the veneer is less than 1/20 in. thick and somewhat porous. The consistency of a glue in part determines whether it will be squeezed through the wood or not. It is quite obvious that under similar conditions a thin glue will penetrate farther than a thick glue. For this reason the quantity of water that is added to a glue might be diminished and "fillers" added when staining is feared. The amount of pressure exerted on the panels in the press is also a factor, but it would not be advisable to reduce the pressure in order to check the flow of the glue.

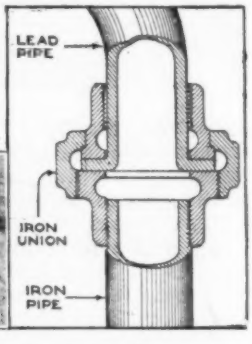
If a panel is dried promptly, the caustic-soda solution will have difficulty in coming to the surface. Rapid drying can be brought about by removing the panels from the press as soon as it is safe to do so, and placing them on stickers.

Casein and vegetable-glue stains can be almost entirely removed by sponging the stained surface with an oxalic-acid solution, prepared by dissolving 1 oz. of oxalic-acid crystals in about 12 oz. of water. Still better results may sometimes be obtained by moistening the wood first with sodium-sulphite solution, made up in the same concentration as the oxalic acid. In this manner very stubborn stains can be obliterated.

Joining Lead and Wrought-Iron Pipe

A water-supply pipe in the basement of a residence developed a bad leak, and, as it was impossible to procure the services of a plumber immediately, the owner was compelled to undertake the repair himself. The leak was at a union connecting a lead pipe to the wrought-iron house pipe, in the wiped joint soldering the union to the lead pipe. As the householder knew nothing about wiping a joint, he resorted to the ingenious method shown in the drawing. The male half of the union, on the lead-pipe side, was re-

A Simple and Quick Method of Joining Lead and Wrought-Iron Pipe, Adopted When a Speedy Repair Was Necessary: The Peened-Over End of the Lead Pipe Forms an Effective Gasket



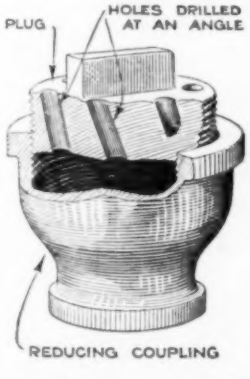
moved from the pipe, the seat filed off flat, and the piece replaced, with about ½ in. of the pipe projecting through it. This end of the pipe was peened over and filed flat, as shown, forming a joint that held perfectly when the union was drawn tight.—John H. Schalek, Pittsburgh, Pa.

A Plate-Glass Lap

For finishing small parts, such as the bottoms and flats of steel nuts, thin plates, and other flat-metal surfaces, a "lap" made from a sheet of abrasive cloth glued to a piece of thick plate glass is convenient. The lap is laid on a smooth surface so that it does not rock, oil is applied, and the objects are worked back and forth by hand in a manner similar to the method of finishing by moving them back and forth over the teeth of a flat file clamped to the bench. A sheet of plate glass, about 4 by 8 in. and ¼ to ⅜ in. thick, is a good size. This glass usually has a nearly plane surface; in fact, often serves the amateur mechanic as a surface plate, but to make sure, the piece should be tested both lengthwise, crosswise, and diagonally with a steel straightedge. Cut the abrasive-cloth sheet the same size as the glass, apply glue, and clamp together in a vise between two soft-wood boards until the glue has set.

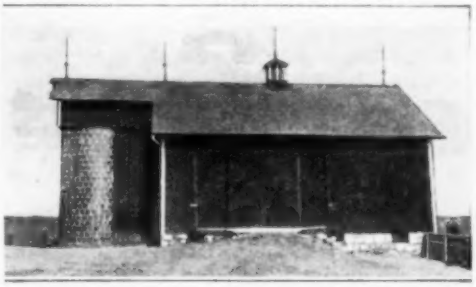
Inducing Draft in a Boiler

Part of a factory smokestack fell down, checking to a considerable degree the draft of the steam boilers. To help increase the draft, a steam pipe with a funnel-shaped end was installed inside the stack; this helped some but not enough. A large reducing coupling and plug were then obtained, and the latter was drilled with a number of holes at an angle, the completed blower, shown in the drawing, replacing the funnel-shaped nozzle first used. The perforated nozzle filled the stack with a column of whirling steam that ascended to a considerable height before losing its "pull."—James E. Noble, Portsmouth, Ont.



Anchoring Silo against the Wind

How to make the tall, slender silo proof against gales is a matter engaging the attention of farmers on the prairies, and in other localities subject to frequent and violent storms. If the silo is built close to the barn, as is the general custom, not only is considerable protection afforded to the silo, but the arrangement makes it more convenient to feed the ensilage to the stock.



By Building the Silo Close to the Barn and Extending the Roof of the Latter over It, the Silo is Well Braced against the Wind

In the case illustrated, the owner has made his silo further proof against wind by locating it at the end of his barn and extending the roof of the latter to cover it. The silo, being stayed by its attachment to the building, is, in consequence, materially protected. The roof extension also provides additional space in the hayloft.—Florence L. Clark, McGregor, Ia.

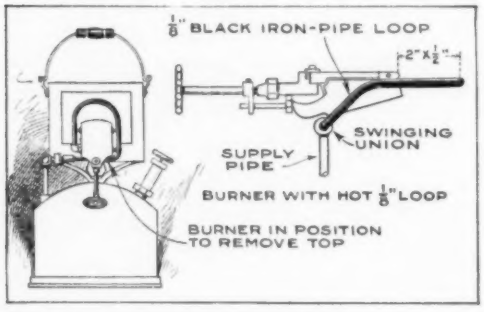
Flexible Couplings from Tires

The fabric couplings between the generator and timing gear, or the circulating pump and generator, of an automobile frequently wear out, putting the pump or generator out of commission. These couplings are seldom carried in stock by garages and service stations, but a satisfactory substitute can be made from sections of an old tire casing, by removing the tread and cutting the remaining layers of fabric to the exact shape of the worn-out coupling. Cut the outside diameter with a pair of shears, gouge out the center hole and bolt holes, and a coupling is obtained that will wear as well as a new part at practically no cost.

¶After babbitting a bearing, if no reamer is available, take a sharp chisel and raise a burr on opposite sides of a steel shaft of proper size, and use it to ream out the babbitt for a working fit.

Hot Loop for Plumber's Fire Pot

Plumbers, cable splicers, and others who use fire pots, will find illustrated a simple remedy for burners that will not



A Hot Loop for the Fire Pot Used by Plumbers, and Others: It Heats the Fuel Before It Reaches the Burner, Making It Easily Vaporized

generate a steady hot flame. The burner is disconnected from the swinging union, and a heating loop, which is made from ⅛-in. iron pipe, is attached to the burner and union, as indicated in the drawing. The loop is placed just ahead of the burner, so that the flame from the burner strikes it, causing the fuel to be more easily vaporized and ignited.—Wm. A. Whitney, Alhambra, Calif.

Chemical Reaction Affects Casein Glue

Although casein glues are highly water-resistant, they ultimately decompose when exposed to damp atmosphere for a long time. Government agencies have long sought the cause of this decomposition, and while these researches are far from complete, the conclusion has been reached that the decomposition of ordinary alkaline casein glues is not due to the action of bacteria or molds, but entirely to the action of the alkali on the glue. This conclusion is based on the following observations:

Increasing the amount of alkali in the glue increases the rate of decomposition when the glue is kept wet.

Glues containing no sodium hydroxide, although deficient in some important respects, do not decompose as rapidly as similar glues which contain sodium hydroxide.

Cultures of molds and bacteria could not be obtained from decomposed alkaline glues.

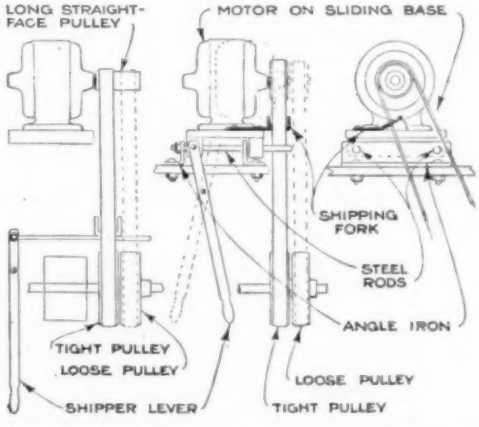
Some chemicals that have antiseptic properties are found to improve casein glue, but this improvement is due to their chemical action rather than to their toxic properties.

It has been found that glues can be completely decomposed in a short time at temperatures above that at which bacteria can grow.

Further work is being done toward the production of glues that will resist chemical decomposition and, at the same time, be impervious to the action of fungi and bacteria as well as moisture.—U. S. Forest Products Laboratory, Madison, Wis.

Starting Single-Phase Motors

A small single-phase electric motor, directly belted to a machine, frequently takes a long time to cut in and operate under full power. To overcome this difficulty both a tight and loose pulley may be attached to the machine driving shaft, and the motor started with the belt



Two Methods of Starting a Direct-Belted Single-Phase Electric Motor by Relieving It of Load until Operating at the Proper Speed

shipped onto the loose pulley. It will come to speed at once, and will then take the load without complaint as long as this is within its rated capacity.

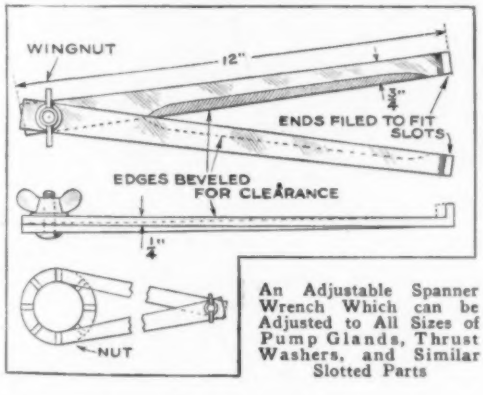
The simplest way to install the tight and loose-pulley drive so that no extra countershaft will be required, is to substitute for the regular motor puiley, a long straight-face one, a little over twice the belt width. Such a pulley will overhang the end of the armature shaft, but as the belt, when at the outer end, will be running on a loose pulley, this will cause no trouble. The outer end of the pulley can be hollowed out to lighten it. To complete the installation, all that is needed is to attach a shipper lever near the machine.

Should this arrangement, for any reason, not be desired, an alternative, but more complicated, method is to mount the motor on a sliding base and shift it back and forth bodily; a shipping fork is attached to the base so as to extend under and around the belt and ship it from the tight to the loose pulley as the motor base moves. The regular straight-face motor pulley is left in place. A shipping lever is pivoted directly to the sliding base, or if the driving motor is at a distance from the driven machine, a long rod or cable, and such bell cranks and other accessories as may be necessary, could be rigged up.

The drawing shows a simple sliding base built up of hardwood, cold-rolled steel rods, and angle iron. Should a round drive belt be used, it could be allowed to run loose while the motor was getting under way, and then tightened by means of a lever or cord-controlled grooved jockey pulley or idler, which would bear against the belt and tighten it until the full load was transmitted.

An Adjustable Spanner Wrench

Spanner wrenches of various sizes are required, in the automobile garage and repair shop, to fit different sizes of pump glands, thrust washers, etc. Instead of an assortment of wrenches, one for each



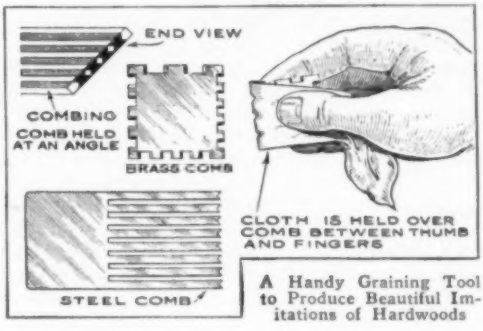
An Adjustable Spanner Wrench Which can be Adjusted to All Sizes of Pump Glands, Thrust Washers, and Similar Slotted Parts

size, the adjustable spanner illustrated in the drawing, which will fit any ordinary work, can easily be made.

Two pieces of bar stock are joined together at one end with a bolt and wingnut for holding the adjustment, the opposite ends of the bars being bent over and filed to fit the slotted nuts. The tool is adjusted by setting the ends to correspond with the slots and turning the wingnut down tightly.

Practical Hints on Graining

In the usual assortment of graining combs used for imitating the natural grain of hardwoods, there is none with teeth fine enough to comb out the work after it has been grained without tearing it to pieces. Many grainers consider that soft cloth is superior to the thin piece of rubber, notched on one side, that is used by others to carry the design of the grain to

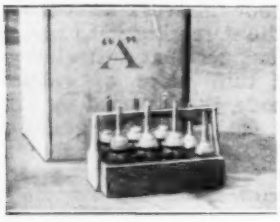


A Handy Graining Tool to Produce Beautiful Imitations of Hardwoods

the edge of a panel. The drawing shows a convenient little instrument that has been successfully used in place of the rubber; it is made from a piece of brass, about 1/8 in. thick and 1 1/4 in. square. Six teeth are filed on one edge of the brass square, five on another, four on the third, and three on the fourth side, producing four different sizes of teeth, which should be made diamond-shaped, as shown in the end view, so that the comb can be held at an angle to the direction in which it moves, and so that it will comb clean. The combination of fine and coarse teeth makes it possible for the user to start with a very fine grain and make it coarser as he desires. Strips of Canton flannel, about 4 in. long and a trifle wider than the comb, are used over it, as indicated in the drawing, to remove all superfluous graining color from the surface, leaving it smooth, while the notched rubber simply removes the color from one place and piles it up in another, leaving the surface rough and ridgy. The cloth may be worked with the thumb and fingers around the comb without loss of time. For the final combing, take an ordinary steel comb that has next to the finest size of teeth, and fasten it in a vise so that the teeth will be held firmly. Then, with a three-cornered file notch each tooth as indicated. The use of a comb such as this tones down the work, and leaves it with the appearance of filled oak.—Geo. F. Sayres, Mt. Solon, Va.

Oil Containers for Service Stations

The photograph shows the method used by an automobile filling station to cut down the amount of time required to replenish the crankcase of a customer's car with lubricating oil.



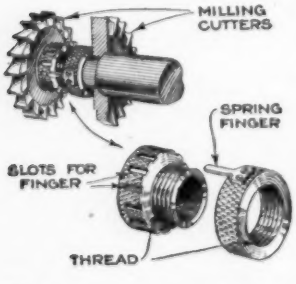
Ordinary fruit jars, of pint and quart sizes, are used as containers for the oil, and these are provided with caps, to which long thin spouts are attached for directing the flow of oil into the breather tube of the engine, which is not always so located as to make the use of a funnel possible without spilling considerable oil. The jars are filled with oil and are held in a carrier holding eight. With the use of this method the saving in time, energy, and oil can readily be appreciated.—Chester Shafer, Three Rivers, Michigan.

Numbering Photo Proofs

When making proofs of photographs for customers, the photographer can save himself the trouble of referring to his register, by marking the number of the negative on the glass side of the negative with a wax pencil, before making the proof. When the proof is made, the number will be printed on it, and the pencil marks can be rubbed off when the order is received.

An Adjustable Spacing Washer

It is often necessary to space the distance between two milling cutters on the same arbor very accurately, and the drawing shows how one shop devised an adjustable spacing collar to accomplish this. Two special collars were made, one with a male, and the other with a female thread.

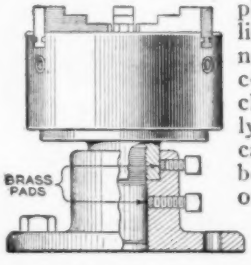


These were screwed together, and to make sure of accurate and handy adjustment, a series of slots was cut around the edge of one collar and a flat spring finger, fitting the slots, was fastened to the other.

To adjust the space between the cutters, it is only necessary to turn the threaded washers a notch or two, depending upon the amount of adjustment needed. In this manner the distance between the cutters can be adjusted with micrometerlike accuracy.

Bench Stand for Chucks

A universal lathe chuck, or a four-jaw independent one, can often be used to advantage on the bench for holding round or irregular-shaped work that would be difficult to clamp in the vise. The drawing shows a cast-iron bench stand and steel stud, and setscrews for holding the chuck in position. A plain threaded stud, like the lathe-spindle nose, would be inconvenient, as the chuck would be likely to unscrew, so a casting is counterbored to take the hub of the chuck flange, which will be generally found to run true with the spindle. If it does not, a light cut should be taken to true it up. The casting is reamed out and the stud turned to a push fit into the hole; the flange hub also makes a push fit into the counterbore. Two setscrews are provided that bear against brass pads and prevent damage to the hub and stud. To rotate the chuck on its stand, both setscrews are loosened; to screw it in or remove it from the stand, the lower screw is tightened. When the work is set in the desired position in the chuck, both screws are tightened.



Cleaning Log-Carriage Ways

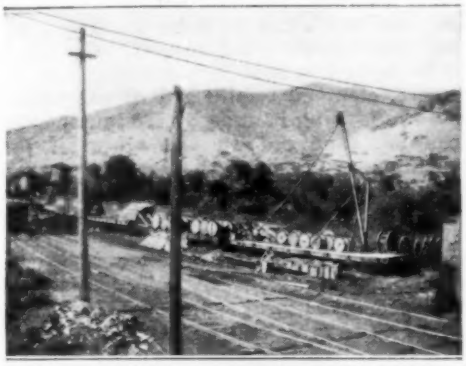
The track on which the log carriage of a sawmill travels often becomes covered with dirt, sawdust, and other débris, and a convenient means of automatically keeping the ways clean with little or no attention will readily be appreciated by the sawyer.

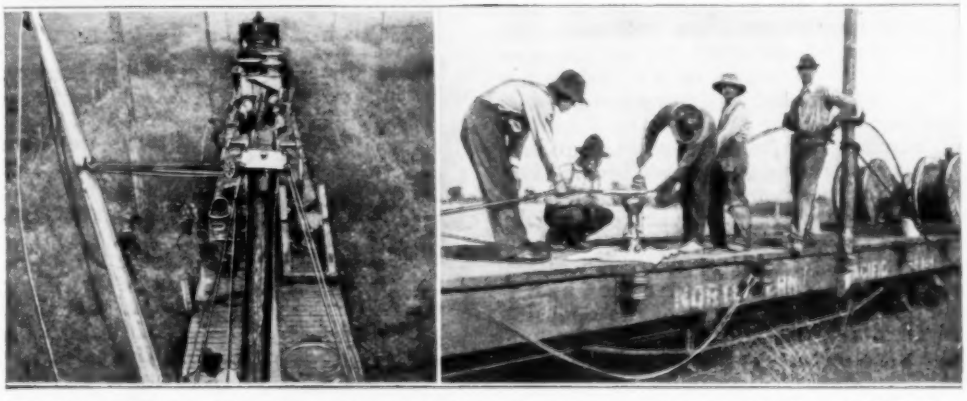
Cut the handles from two ordinary brooms and fasten the brooms to the front of the log carriage so that they will just touch the track. At each trip the brooms will sweep the track clean of accumulated litter.—Chas. H. Carr, Youngstown, Pa.

Stringing Wires and Cables along Right of Way

By CHARLES OMEN

THE photographs show the methods used in stringing the wires and transmission cables along the right of way of a western electric road. By these simple methods, the time and labor estimated for the job by the engineers were reduced by about 30 per cent. The line was 37 miles long, and practically all the work, with the exception of tying the various lines to the crossarm insulators, was done from the construction train.





A Method of Stringing Wires along a Railroad Right of Way That Resulted in the Job being Finished Ahead of Contract Time: The Equipment Is Simple and Enables a Much Smaller Crew to Do the Work with Less Labor, Especially Where Very Heavy Wire is Handled

At one end of a flat car, which was coupled to the rear of the train, a boom was erected, in such a position that it could be swung to place the wires over the crossarms of the poles at any ordinary distance from the tracks. The other cars of the train were used for carrying extra cable drums, and other construction materials, as is shown in the upper photograph. The wires and cables were led from the drums on which they were wound, through snatch blocks, to the end of the boom in the manner shown in the lower left-hand illustration, so that by manipulating the boom the line could be laid over the crossarms as desired. When the end of a reel of cable was reached, a splice was made, as shown in the right-hand photo. A special clamp is shown attached to the side of the cable splicer's car, and this was used for drawing the line tight. As one end of the wire cable to which the clamp was attached was made fast to the car, drawing the line tight was merely a matter of clamping it to the cable and driving the engine which pulled the train a slight distance forward, or until the proper degree of tautness had been obtained. The copper feed wire strung by this means weighed 2 lb. per foot and was handled with ease and speed, and the smallest day's work of the outfit and crew was the stringing of a trifle less than two miles of cable.

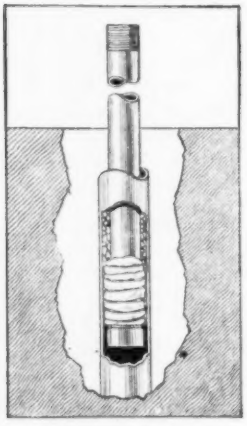
The same idea, applied to stringing light wires used in telephone lines, has been used with similar results, the only difference in method being that the boom was mounted on a truck, which was driven along the road beside the line of poles; the boom was operated by hand, through a block and tackle, although some form of power could easily have been applied.

Cleaning Gas-Engine Water Jacket

The scale that forms on the inner walls of a gas-engine water jacket usually consists of lime deposited from the circulating water, and can be removed by a solution composed of one part muriatic acid to four parts of water. As soon as the solution has done its work, the water jacket should be thoroughly washed out with clean water to prevent corrosion.

Removing a Broken Drive Pipe

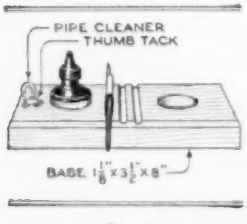
It is not necessary to lose a string of drive pipe in an abandoned gas well, even if it should break while pulling it, as the method described made it possible to recover nearly 200 ft. of drive pipe, in the absence of the usual fishing tools.



The pipe pulled apart 24 ft. below the surface—too far to dig in order to get another hitch—so an improvised tackle was made by wrapping an old jumper around one end of a section of 4-in. casing just above the collar, and tying it with binder twine. A little tar was smeared over this wrapping, and the casing was lowered into the hole until the old jumper, which fitted the broken pipe like a gun swab, was 3 or 4 ft. below the break. A bucketful of sharp gravel, about pea-size, was then poured into the hole. By moving the joint of casing up and down a few times, the gravel became imbedded in the jumper and bit into the inside of the drive pipe, securing a grip that was sufficient to lift the 196 ft. below the break. The grip of the swab inside the pipe was so strong that the smaller pipe had to be driven out of the opposite end after the first joint of drive pipe had been unscrewed.—Theo. Wilson, Indianapolis, Ind.

A Drawing-Pen Cleaner

All drawing pens should be wiped dry of ink and frequently cleaned while inking in a drawing or tracing. A cloth is generally used for the purpose, but this is a nuisance and requires the use of both the draftsman's hands.



A piece of pipe cleaner, attached to a convenient point on the inkstand or drawing board with a thumb tack, makes the easiest and quickest means for cleaning the pen thoroughly.

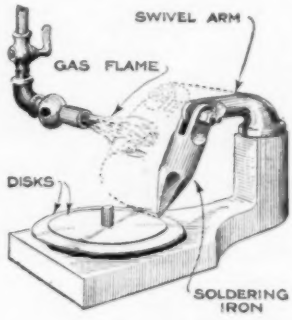
The inkstand shown is in itself a desirable accessory for any drawing table, and is made from a hardwood block, drilled out to the diameter of the ink bottles, and provided with two or more central grooves for pens and pencils.

Lapping in the Milling Machine

Hand lapping is very slow and tedious, but if a milling machine is available, many forms of work can be done much quicker and with equally good results. The work to be lapped is held in a suitable vise, or fixture, clamped to the bed of the miller, and the lapping is done by a circular cast-iron lap mounted on the arbor of the machine. Whenever the lap is removed from the arbor, it is necessary to take a light cut from each surface before using it again. The lap can be refaced quickly by using a square tool bit clamped in the milling-machine vise. A lap of this kind is especially useful when lapping such pieces as snap or caliper gauges.

Quick Method of Soldering

When done in the ordinary manner, soldering of circular work is far from easy, but where the work is all of one, more or less standard, size, the device shown in the drawing can be used effectively. The arrangement was designed to solder two disks together. As the two disks both had central holes of the same size, they were merely placed over the pin to bring them to the proper position for soldering. The disks were spun around with a small file while the solder was held to the work, and the soldering iron kept hot by a gas torch, conveniently arranged, as shown.



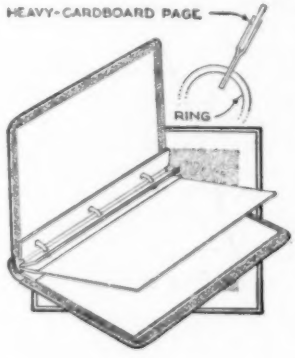
Setting Duplex-Pump Valves

To set duplex-pump steam valves, the pistons must first be set at the center of their strokes. To do this, move them until they make contact first with one head and then with the other, marking the piston rod, when the pistons are at each end,

by means of a scriber pressed against the stuffing-box glands. Then, on each rod, make a mark exactly halfway between the end marks, and set this center mark to line with the edge of the gland. The pistons are now exactly at the center of their stroke, and the valve-motion rocker arms should be perpendicular to the piston rods. If they are not, the crossheads must be disconnected and replaced, to correct the position of the arms. Remove the steam-chest covers, and place the valves centrally over the ports, adjusting the lost motion of each valve so that there will be the same clearance at each end. If, when the pump is run, a steam piston strikes the head of its cylinder, some of the lost motion must be taken up. If the piston does not move a full stroke, more lost motion must be allowed.

Fastening Cards in Loose-Leaf Binders

Ordinarily the insertion of a heavy-cardboard page into a loose-leaf binder is more or less difficult. Besides the trouble of perforating the thick cards cleanly, their edges bind against the inner circumference of the swivel rings, so that only a few such pages can be held, and it is difficult to turn them.

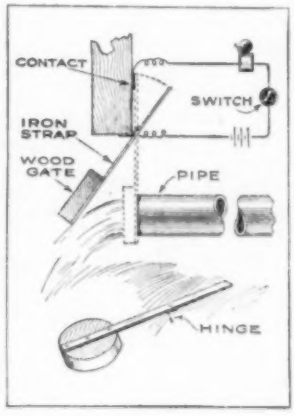


The method illustrated overcomes these troubles in a very simple manner. For every cardboard page to go into the binder provide a strip of strong gummed paper, or linen, such as can be obtained at stationery stores in small rolls. These strips should be the same length as the card and be folded down their centers, with the ring perforations made at a suitable distance from the folded edge, to prevent tearing. Paste each such strip to the edge of a card, as indicated in the detail, so that the card is entirely dependent upon the strip for its attachment and insertion in the binder.—C. Nye, New York, N. Y.

¶Oilstones and razor hones that have "filled up" with steel particles may be cleaned by washing first in hydrochloric acid and then in clear water.

Stoppage in Flow Gives Alarm

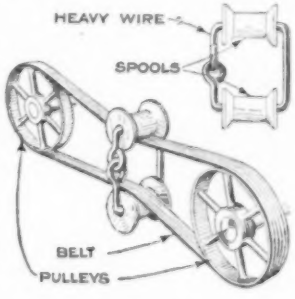
Intended to be used on a horizontal discharge pipe, the alarm system illustrated is of special use in irrigation systems, for notifying the attendant, who may be some distance away, that the water has ceased to flow, owing to pump trouble or other fault.



An ordinary wooden disk, or a flap valve, is mounted over the end of the pipe, so that its own weight will cause it to close immediately the water ceases to flow from the pipe. The gate or valve is mounted on an overhead support to which it is hinged. A contact is arranged on the support so that as soon as the flap closes, the end of the iron strap on which it is mounted, will press against the contact, closing the circuit and ringing the bell, which is connected in the manner shown.—L. B. Robbins, Claremont, Calif.

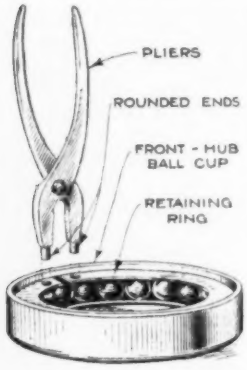
A Simple Belt Tightener

One of the most disagreeable jobs of the millwright in a manufacturing plant, is the constant tightening of the small belts that drive the pumps supplying cooling and lubricating compounds to the cutters of lathes, milling machines, and other tools. The device shown in the drawing is made from two spools held together by a piece of heavy wire. Several such tighteners can be made and kept handy and slipped into place over the belt as indicated. A little graphite or hard grease applied to the spools makes them practically noiseless in operation. The tension can be regulated by lengthening or shortening the wire.



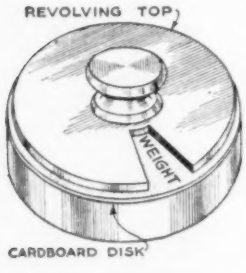
Pliers for Ball-Bearing Rings

The spring rings that retain the balls in the cup of the front-hub ball bearings of a light automobile are difficult to remove and replace by ordinary methods, such as prying with a screwdriver, which usually results in damage to the parts. The drawing shows a simple tool for the purpose that avoids bending and distortion. It is made from a pair of pliers, preferably of the round-nosed variety. The nose of the pliers is ground down until the separate jaws fit in the drilled holes in each end of the ring. To compress the ring the jaws of the pliers are placed in the holes and the handles pressed together, drawing the ends of the ring together and making it instantly removable.



Device Aids in Checking Drawings

One of the problems encountered in the drafting room is that of checking drawings. "To err is human," and even the experienced checker is not free from forgetfulness, sometimes overlooking important points, with unpleasant results later. One drafting chief solved the problem by providing his checkers with the mechanical reminder seen in the drawing. A round wooden block is used for a base; on this block is glued a circular card, divided into segments. On each segment is lettered a word suggesting one point that must be checked on each drawing; for instance, weight, materials, dimensions, strength, etc. Over the card a thin wooden top is placed, revolving on a center pin; the top is provided with a knob, for ease in rotating, and a segment, the same size as those marked on the card, is cut from it, as indicated. One item on the card is marked with the figure 1, and the checker, after checking this item, turns the top until the next word appears in the opening.

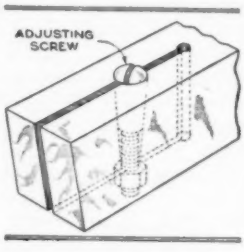


By this means, he is relieved of the necessity of remembering what items he has already checked, and is thus enabled to concentrate on the one in hand.

This device is not only an excellent reminder, but serves as a paperweight also.

An Adjustable Grooving Tool

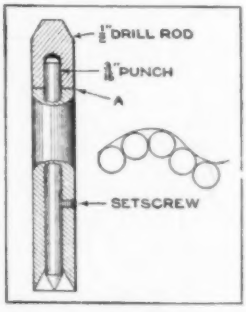
When grooves must be accurate as regards width, as in ring grooves in pistons, an adjustable grooving tool of the type shown will be found very convenient. With a solid tool, the accuracy is lost after a few grindings, the result being that, in the case of pistons, the rings will not fit properly. A further advantage of the tool shown is its ability to take care of rings that may be a few thousandths thicker than the required size.



The tool is made as for an ordinary grooving tool, then drilled and taper-reamed to take the taper-adjusting screw, and a slot sawed down the center. When the tool begins to cut small, after grinding, it is brought back to the proper size by a slight turn of the adjusting nut.

Handy Laying-Out Punch

A handy punch, of service when laying out dies, cams, and work of a like nature in which there are cores to be drilled out, is shown in the drawing. A 3/16-in. hole is drilled along the axis of a piece of 1/2-in. drill rod, to within about 3/8 in. of one end. The opposite end is chamfered so as to leave a cutting edge around the circumference, forming a hollow punch, and the piece is then cut at A. A piece of 3/16-in. drill rod, fitting the center hole, is then cut, of a length sufficient to reach a little above the end of the longer portion of the hollow punch; the end is pointed to form a



prick punch, and the parts are then hardened and tempered.

To avoid loose parts, two additions may be made to the tool: one, a small setscrew bearing on a flat on the punch; the other, a small chain, such as used for grease-cup covers, attached to both upper and lower sections of the hollow punch.

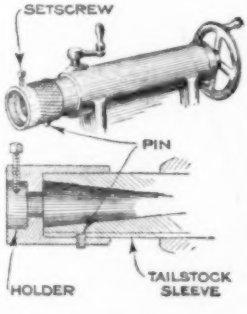
After the outline of the cam or die has been scribed, take the tool, place it on the work so that the outer edge just bears on the line or a thousandth inside it, then give it a smart tap with the hammer.

A circle marking the diameter of one hole will thus be made; take the cover off the hollow punch and tap the prick punch with the hammer; this marks the center.

The tool is then adjusted to touch both the line and the edge of the circle just marked, and the procedure repeated. This method of marking the holes will be found both quick and accurate.

A Die Holder for Lathe Tailstock

A die holder that is convenient when threading work in the lathe is illustrated in the drawing. It may be made from cold-rolled steel, casehardened, and slips over the tailstock sleeve, the die being held in the usual way by a small setscrew. A small pin in the holder fits in the tailstock-sleeve keyway, preventing rotation.



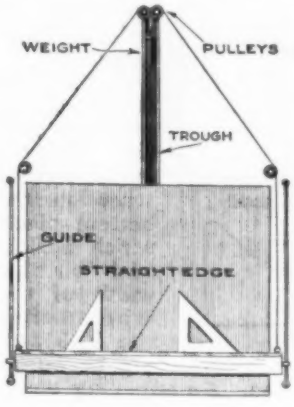
In use, the die is fed onto the work, the handle on the tailstock spindle being used to start the first few threads, thereafter being turned slowly to take up the slack as the die feeds itself forward. When sufficient thread has been cut, the lathe is stopped, the tailstock loosened and pulled back, and the die holder gripped in the hand while the lathe is reversed, running the holder off the work.—E. Schmidhauser, Monroe, Mich.

Painting Soil Stacks

As a rule, the tar coating on soil stacks will show through any light-colored paint used on them. Give the pipes several coats of shellac, then any color can be used without the tar paint showing through.

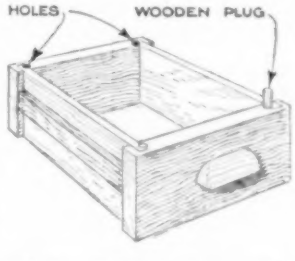
Parallel Ruler for Blackboard

To keep the straightedge always in position for use and always parallel with the top and bottom of the lecture-room blackboard, the arrangement shown in the drawing was devised. A screweye in each end of the straightedge slides on a guide at each side of the blackboard. The guides are made of round iron rods, with an eye at each end for attachment to the wall with screws. The weight of the straightedge is counterbalanced by a single weight, connected to the ends of the straightedge by cords that pass over pulleys, as shown. The weight is suspended in a three-sided trough that prevents swinging of the weight and consequent pulling of the straightedge from the horizontal.—E. H. Krieder, Lancaster, Pa.



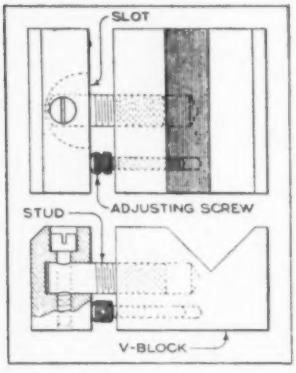
A Practical Cabinet Joint

A substitute for dovetailing the joints of drawers and similar cabinetwork, which is equally satisfactory, and does not involve the work and skill necessary to make an accurately fitted dovetailed joint, is illustrated in the drawing. Where side lengths are joined to the front and back of the drawer, a mortise is made a slight distance from each side in both the front and back pieces, and the sides are inserted and glued in the usual manner. A hole, about 1½ in. deep, is drilled at the top and bottom of each joint, as shown, and wooden plugs of corresponding length and thickness are driven in, after having first been coated with glue.—Alex. Mackey, Powers, Oregon.



An Adjustable Angular V-Block

The drawing shows the construction of an adjustable V-block that is particularly useful for milling round stock with a flat taper, and for operations of a similar character.

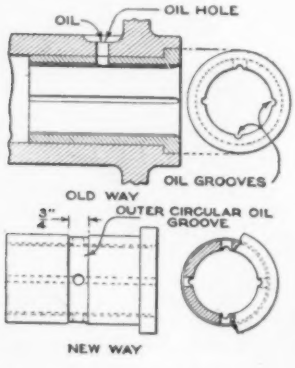


The V-piece is tapped to take the stud that swivels on the vertical screw in the bottom piece, which is slotted for the width of the stud so that the V-block can be set in an angular position. An adjusting screw makes the setting more convenient and accurate, and also prevents movement of the block under pressure.

To operate, set the V-block to the required angle, place in the milling-machine vise, with the bottom piece resting on the vise bottom. Only one block is necessary, and it will be found that jobs of the type described are executed much more easily.

Oil Grooves in Babbitt Bearings

After experiencing considerable trouble with a number of large babbitt bushings, due to their turning in the seats, and clogging of the oil holes, I changed the system of lubrication and cured the trouble. Originally an oil hole was drilled through the bushing and an oil groove run through it. This necessitated the exact positioning of the oil holes in both bushing and frame, and while this was comparatively simple, yet the bushing would turn at times, even though driven in tight, and throw the holes out of register, thereby causing a lack of lubrication that resulted in burned-out bushings.

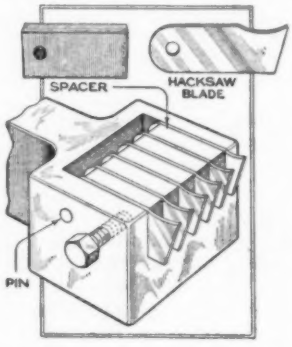


The remedy is simple and highly efficient. A groove is turned around the outer surface of the bushing so as to aline with the oil hole in the frame. This groove is about ¾ in. wide, and three or four oil holes are drilled through its center. Meeting and running through these oil holes on the inner surface, are three or four oil grooves, as illustrated.

It can be readily seen that no matter in what position the bushing may be, it will always get all the oil that can be introduced through the stationary hole in the frame. Also, better lubrication is obtained from the four grooves.—Joe V. Romig, Allentown, Pa.

A Multiple Parting Tool

A novel way of using up the ends of broken or worn power-hacksaw blades, by using them as cutters of a parting tool for cutting off piston rings, is shown in the drawing.



A suitable holder was forged and milled out to take the required number of blades and spacing blocks, the latter being of a thickness equal to the width of the rings. A hole is drilled through both sides of the holder, for a locating pin that passes through the holes in the ends of the cutters and spacers, lining the whole assembly up at once. A setscrew is used to bind the assembly.

Line Shaft Used as a Hoist

A method of lifting heavy weights off the floor in the shop, when tackle blocks are not available, is to make use of a line shaft if there is one near by. All that is necessary is to pass the rope over the shaft once or twice, so that it makes either one-half turn or one and one-half turns around the shaft. Then, by pulling down on the end of the rope, the moving shaft winds up the rope and lifts the weight. When the load is lifted high enough, simply stop pulling on the rope which will then slip on the shaft, and the weight will hang at rest or fall back again if the rope is entirely loosened. It is necessary, of course, to use some caution in

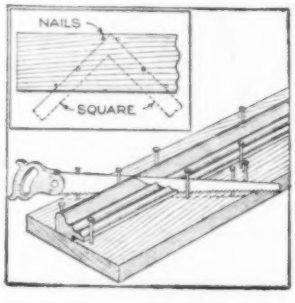
applying this idea. If the shaft is at all loose or rusty, the rope should never be thrown twice over the shaft until one has experimented with the single half-turn and made sure there is no danger that the rope will refuse to loosen its grip on the shaft when slackened. There will be little or no danger of this ordinarily, unless the shaft is pretty high up and the rope fairly heavy.—Curtis Ralston, Chicago, Ill.

A Serviceable Pricker for Draftsmen

A serviceable and practical draftsman's pricker can be easily made from a darning needle of proper size and a clutch pencil or lead holder. The pencil should be one that accommodates a large lead, and if one of this sort is not available, the nose should be filed down until the hole will fit the needle, the point of which can be finished off to suit with a fine file. After the needle is in its proper position, it is soldered in place and finished as neatly as possible.—E. S. Frye, Owosso, Mich.

Miter "Box" from Nails and Square

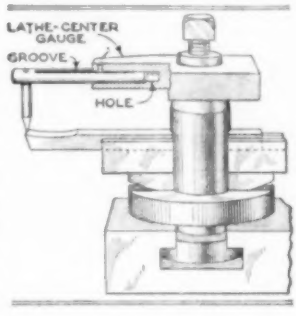
A fairly good substitute for a miter box, that can be used for small work, such as molding and the like, can be made on a board 6 in. or more in width, nails being used as a guide for the saw. With a square or straightedge, mark the lines of the angle that the miter is to be cut. In selecting the nails to be used choose those that are straight and smooth. Along one side of the line—close but not quite on it—drive two long nails, as in the drawing; equally close to the line, but on the opposite side and between the first two nails, another long nail is driven to guide the saw.



In use, the work is laid along a center line marked along the plank, and the molding is pressed against nails driven along this line as shown. Accuracy in driving the nails will greatly increase the merit of this miter box, and after the nails have been drawn, the plank can be used elsewhere.—Truman R. Hart, Ashtabula, Ohio.

A Lathe Center Gauge

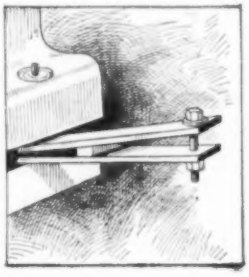
When boring, internal threading, or facing on a lathe, the operator cannot use the tailstock center to set the tool to the proper height, and many methods, such as a mark on the chuck or faceplate, which must be brought to a certain position, are used to obtain this result.



The gauge shown in the drawing is a very handy tool and can be quickly applied. A piece of flat stock is bored to fit the tapered portion of the toolpost and is drilled lengthwise to take a sliding arm, tapped at the outer end and fitted with an indicating pointer. A small groove is cut in the top of the adjustable arm, in which a pin engages, to prevent the gauge from coming apart. The point should be exactly on the center line of the lathe when the gauge is in its position on the toolpost. The gauge is especially useful for setting the tool when cutting internal threads. It is not, of course, necessary that the gauge should remain permanently on the toolpost.

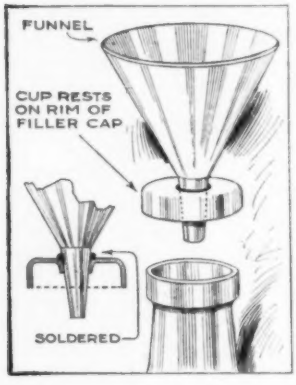
An Improvised Jack

For adjusting castings and machinery to the proper height, for setting them level, or in proper position with another part, it is frequently necessary that the adjustment be maintained for a period while other work is being done. The drawing shows a simple jack for this purpose that consists simply of two strips of steel and a bolt. A hole is drilled through one end of each piece for the accommodation of the bolt, and the opposite ends are inserted underneath the work to be raised; a fulcrum in the form of a small block of metal is placed between the bars, and as the nut is screwed onto the bolt the work will be elevated until it reaches the correct height.



Flanged Radiator-Filling Funnel

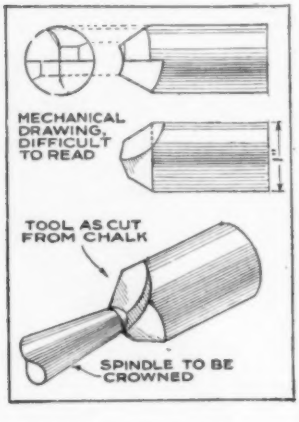
For garages and service stations, where a funnel is frequently used to fill automobile radiators, the modified type shown in the drawing will prove highly satisfactory, as the funnel is always upright and spilling is largely prevented.



The funnel has an old bearing cup soldered or brazed over the outside as illustrated, with the concave side of the cup down. The spilling of alcoholic antifreezing solutions over the hood and radiator of the car should be prevented, as the alcohol will attack the varnish and cause white spots.

Modeling Small Tools in Chalk

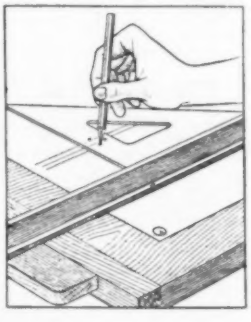
It is often difficult to show detail draftsmen or toolmakers the correct form of small tools by sketches, so, in one shop, the plan of taking a piece of ordinary chalk and cutting it out with a knife to represent the tool was adopted. To show the value of the idea, it was necessary in one case to make an end mill to crown the end of a spindle, the tool to be held in the turret of a lathe. Roughly, this cutter would look something like a "fishtail" cutter, but even after it was accurately drawn up in three views, no one but the designer could tell what it looked like. It was then that the plan of cutting the tool out of chalk was conceived, thus making the idea perfectly clear to the draftsman and toolmaker. The drawing shows how the tool appears as a mechanical drawing and an isometric sketch of the chalk as it was cut out.



This incident shows the advantage of the practice, customary in some drafting rooms, of making an isometric sketch of the part in one corner of every mechanical drawing. Isometric drawing is easily learned, and it takes very little time to draw in a "picture" of the tool, or machine part, as it really looks. This has been found to save a great deal of the workman's time, as he is not obliged to correlate several different views in order to form a mental picture of the object. The practice, especially with complicated parts, is one that is worthy of much more extensive use.—Burr Bennett, Honesdale, Pennsylvania.

A Lettering-Gauge Idea

The draftsman's ordinary transparent triangle may take on an additional duty as a gauge for properly spacing the guide lines for lettering, particularly where the size of the lettering is standardized. Most ideas of this character involve the cutting of notches somewhere into the edge of the instrument and this is frequently objectionable.



Space, as desired, a number of small holes that are drilled through the triangle, the holes being just large enough to admit a sharp pencil point. The draftsman may apply to these holes any system of marking that is practical for his use. In operation, the point of a pencil is inserted in one of the holes and the triangle pulled across the paper as indicated in the drawing.—C. Nye, New York, N. Y.

Copper-Coloring Brass

On page 452 of the September issue of the magazine, appears an article on copperplating brass. The formula given therein contains an error that would render the solution inoperative. The correct formula is: 3 oz. sodium cyanide, 2 oz. copper carbonate, and ¼ oz. sodium hyposulphite, or ½ oz. sodium carbonate; dissolve in 1 gal. of water. A current pressure of one or two volts should be used, as a much higher voltage tends to cause "pitting," or to burn the work.

Amateur Mechanics
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

The Breakfast Nook

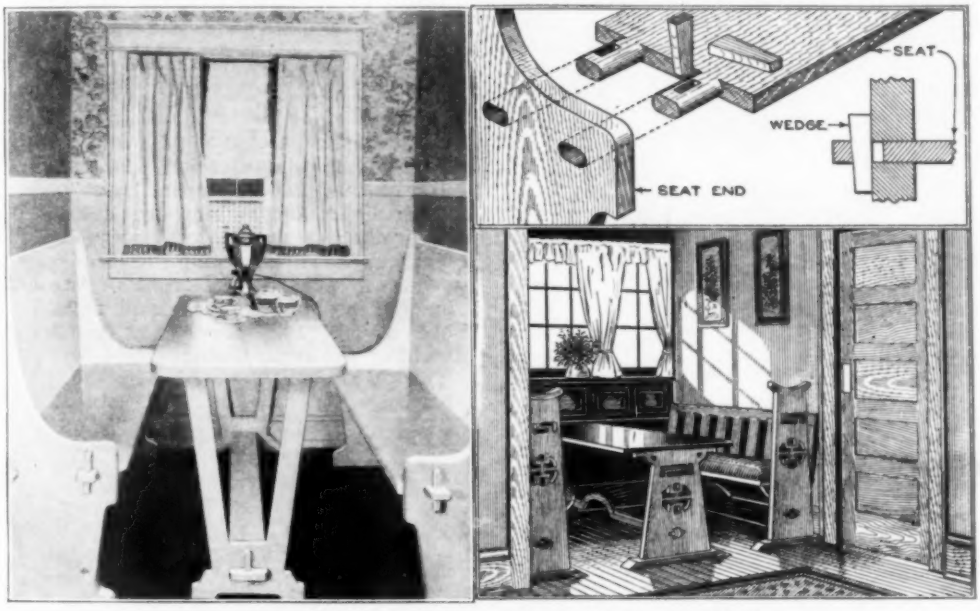
By H. C. CROCKER

IN almost every kitchen there is sufficient space for the construction of a "pullman," or built-in, breakfast nook. It may be made by any man possessing a little mechanical ability, at a cost of only a few dollars for lumber, and will save the housewife innumerable steps between dining room and kitchen.

The seats and table may be built with only the simplest outlines, as in the left-hand illustration, or may be decorated with curves, carvings, or cut-out designs, the latter form of treatment being shown in the right-hand view.

The space required for such a nook is about 5 by 8 ft. The backs of the seats should be about 8 ft. apart, and the length of the table should be about 5 ft., when built for use by four persons. Either cypress or fir should be used for the pieces, the latter being preferable when the finish is to be white paint or enamel.

The seat ends should be made first; if four ends are employed, the first one made will serve as a pattern for the remaining three. Only two seat ends may be used, if desired, instead of four, the inner ends being recessed into the wall, or supported on plain feet, as may be found necessary. The mortises for the seat tenons should be cut so that the seat will slant slightly toward the rear, and the armrests may be made at any height desired, although 3 or 4 in. above the seat will usually be all that is necessary. The inner seat ends are securely fastened to the wall, and the outer ones to the floor, by heavy screws driven at an angle from the inner side of the base. The seat itself is fastened to the ends by screws, or by the neater arrangement



An Easily Constructed Breakfast Nook That Saves the Housewife Innumerable Unnecessary Steps in the Course of a Few Months: Two Designs are Shown, with Details of the Method of Fastening Seats and Footboards

shown, in which slotted tenons project through the mortises in the ends, and are drawn tight by wedges. The same method of fastening is employed for the table footboard.

The table top should not be less than 2½ ft. wide, and should be about 4½ ft. above the floor. The table with open legs will demand less lumber than the one with the solid legs, and may be preferred for this reason; the table is also fastened solidly to the floor by means of heavy screws. When all the pieces are finished, they should be thoroughly smoothed with sandpaper before the finish, stain, or enamel is applied.

Hot Water Always Handy

The photograph shows an easily made galvanized-iron tank placed on the kitchen

A Three-Gallon Tank, Made from Galvanized Iron, Provides an Ever-Ready Supply of Hot Water for the Kitchen

range where it will not interfere with the use of the holes for cooking and other purposes. The tank shown has a capacity of 3 gal., although this is a matter of individual choice, and a faucet from an old water cooler is soldered to one end for drawing off the warm water.—C. R. Gains, Colfax, Ia.

A Simple Print Washer

A cheap and efficient print washer can be made from a few feet of ordinary garden hose.

One end of the hose is fitted with a regular faucet coupling, and the loose end is plugged, the plug being held in place with a wrapping of string or wire. Beginning at the proper distance from the faucet, usually about 2 ft., one or more rows of small holes are punched through the hose at intervals of about an inch. In use, the piece of perforated hose is coiled in the bottom of the sink or wash box, with the holes up. As the water is forced through the holes the prints are kept in motion and each one receives a thorough washing.

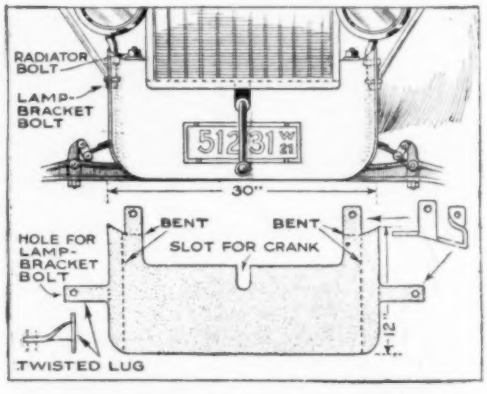
Iridescence on Surface of Lenses

The iridescence on the surface of photographic lenses and similar objectives, is not, as sometimes thought, a sign of deterioration of the balsam used for cementing the various elements together, for this is shown by a sort of treelike marking that extends from the edge toward the center. Iridescence on the surface of the lens indicates corrosion of the glass itself, for which there is no remedy except a careful repolishing of the glass surfaces by the manufacturer.

Apron and Mud Shield for Light Car

A sheet of metal 12 by 30 in., cut according to the pattern shown, and held in place by the lamp-bracket and radiator bolts, so that the frame and front spring of the light automobile are concealed, will produce a material improvement in appearance. In addition, this fender, or apron, will prevent the front of the car from being splashed with mud from the front wheels, and provides a place for attaching the front license plate.

The sheet metal used should be of about



An Apron or Shield for the Light Automobile That Prevents the Front of the Car from being Splashed with Mud from the Front Wheels

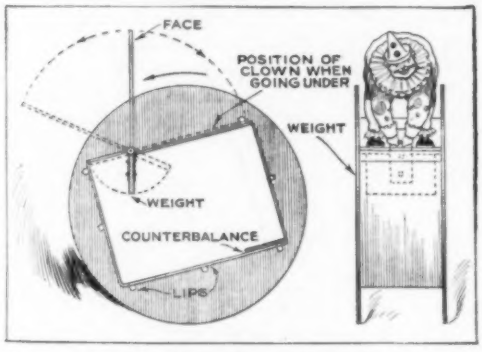
the same gauge as that used for the body and fenders. A pattern should first be made from stiff paper, or cardboard, with

the positions of the bolts accurately marked. The shield is then cut from the pattern and fitted. The lower corners should be rounded and the outer edges curved forward to ward off the splashed mud.

A Performing Clown Toy

A performing clown, run over by the wheel to which he is attached, and then bobbing up serenely and uninjured, is the feature of an easily made toy for the entertainment of the youngsters.

Two disks of the same size are cut out of tin, or other light metal, and the clown can either be cut from a piece of tin and suitably painted, or made of a piece of stiff cardboard. One end of the figure is provided with a small weight to hold it upright, the whole being pivoted on a light shaft passing through both disks. The disks are held apart for a little more than the width of the figure by a strip of tin, bent to form a rectangle and having small lips on each edge; these lips project through slits cut in the disks, and when



A Clown Toy for the Children: When the Toy Revolves in a Forward Direction the Clown is "Run Over," Only to Pop Up Serenely on the Opposite Side

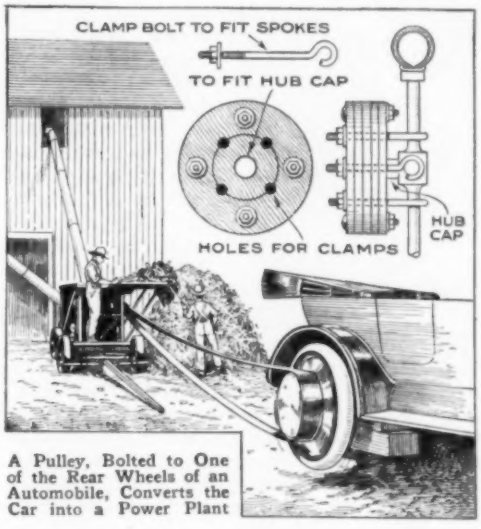
bent over parallel with the latter, serve to hold the whole toy together. A counterbalance, soldered or riveted in one corner of the hollow box formed by the tin strip, keeps the weight of the figure from pulling the toy down.

Every time the toy is rolled in a forward direction the clown flattens out against the tin strip, and as the rotation is continued he pops up again from the opposite side.—D. W. Clark, Buffalo, N. Y.

¶By buying up a number of discarded inside window shutters, a resourceful eastern woman has procured excellent material for paneling her dining room.

Detachable Pulley Converts Automobile into a Farm Power Plant

An automobile can be used to furnish power for operating any machine within the capacity of the automobile engine.



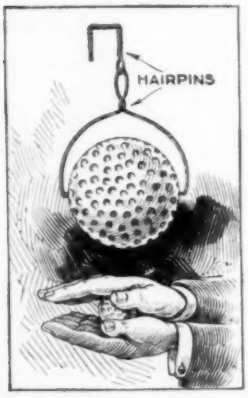
A Pulley, Bolted to One of the Rear Wheels of an Automobile, Converts the Car into a Power Plant

A pulley is built up from six or more oak disks, 1 in. thick and about 12 in. in diameter. The disks are assembled in a pile so that the grain of no two pieces runs in the same direction, with the exception of the two outside disks. Plenty of hot carpenters' glue is used between the disks, and pressure, by means of weights, is applied to the glued-up assembly, which is allowed to set until the glue has thoroughly hardened. Four holes are drilled and the pulley is bolted together with ½-in. bolts. A hole is cut in the center of the pulley of sufficient depth and diameter to fit the hub or hub cap of the car tightly, so that the pulley will be held away from the spokes for a short distance, to prevent the edge of the belt from coming into contact with the wheel. Four heavy clamp bolts, of the type shown, are made with the hook just large enough to fit around the spokes of the wheel, and long enough to pass through holes drilled in the pulley. To prevent the clamps from marring the spokes of the wheel, the hooks may be made a little larger and covered with a piece of hose.

Such a pulley can be attached to either rear wheel, which is blocked up from contact with the ground. The speed and power of the engine are controlled in the same manner as the car is ordinarily operated.—B. Francis Dashiell, Dunkirk, Md.

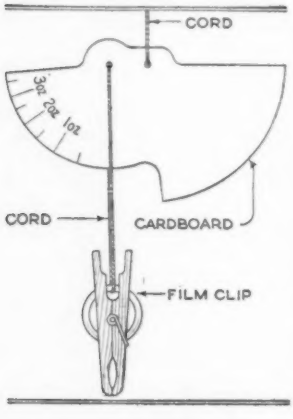
Refinishing Old Golf Balls

After being driven around the links for a few weeks, a set of golf balls takes on a rather dilapidated appearance, making them not only unsightly, but more difficult to find in the "rough." To remove the old enamel, soak the balls in a solution of two teaspoonfuls of lye to a pint of cold water until the paint is easily removable. Wash thoroughly in several changes of cold water, and allow to dry. To repaint the balls, a small amount of golf-ball enamel is poured into the palm of the hand, and the balls are rolled as indicated in the drawing. The balls can be suspended while drying without coming into contact with anything, by means of the wire hanger shown in the drawing, which is formed from ordinary wire hairpins.—H. H. White, West Baden, Ind.



A Simple Postal Scale

The scale illustrated is made from a piece of stiff cardboard, about 1/16 in. in thickness, and is designed to weigh letters and similar light objects up to 3 oz. The radius of the segment on which the scale of weights is lettered is 3 in., and that of the larger balancing segment is 4 in.; the suspension points are 1/2 in. apart and are formed at the centers from which the arcs are described. The suspended film clip can be quickly snapped onto the article to be weighed, the action of the scale being similar to the old-fashioned steelyard. Any light clip will serve for the purpose. The various weight divisions on the scale can be found by using small weights of known value, suspending them from the clip and graduating the scale according to the position of the string on the scale.—Harry W. Poor, Boston, Mass.



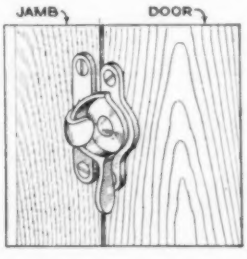
Removing Negative Scratches

Sometimes a scratch will appear on the "glass" side of a photographic negative, directly over the face, or some other important detail of the image.

To remove such scratches, a little of the finest emery flour is mixed with alcohol to the consistency of thick paste; this is rubbed over the scratch with a piece of flannel. In a very short time the scratch will have disappeared, leaving the glass smooth.

Window Sash Lock for Doors

An excellent device for locking a door from the inside, that is as effective as the old reliable bolt or chain, is made from an ordinary sash lock, as shown in the drawing. The lock is fitted to the door, with the catch mounted on the jamb, as illustrated; if additional security is wanted, two such locks can be attached, one a foot from the top, the other a foot from the bottom of the door. Such a lock can also be usefully applied to the doors of refrigerators and cigar cases, which must be kept tightly closed.—Charles Anderson, Chicago, Ill.



Starting Car with Shorted Ignition

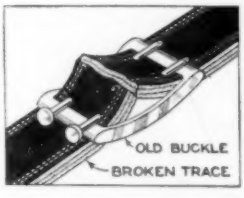
If an automobile of a certain popular type is left unprotected during a rainstorm, water will leak down back of the dash and short-circuit the ignition, making it impossible, in most cases, to start the engine. This short-circuiting is caused by the damp wood which permits the ignition current to pass through it with more or less freedom. However, unless the wood is very thoroughly soaked, the auto can usually be started without waiting for a service car with an extra coil box.

Take all the coils from the coil box and wipe both the coils and box as dry as possible; then remove all the spark plugs and shorten the gap between the elec-

trodes until it is no greater than the thickness of a piece of paper. After replacing the plugs, the motor may be started, if it can be started at all. Most owners being thus caught for the first time will crank violently for some time with no result and conclude that the engine will not start until the ignition system has dried out. However, shortening the spark gaps makes it easier for the spark to jump across there than go through the wet wood, and many cars started in this manner have fired on all cylinders, where not a single explosion could be obtained before. The gap may be increased after the wood has dried out, as the short gap will not fire the mixture as satisfactorily as the spark of correct length, although it is better than no spark at all.—Harold E. Benson, Boulder, Colo.

A Simple Harness Repair

The drawing shows a simple method of repairing a broken harness strap or trace; one that will hold until the proper kind of a job can be done by sewing or riveting. As indicated, the ends of the straps are brought together inside an old buckle, and two nails are driven through the leather, with their ends bearing against the buckle. A steel harness ring can be used in the same manner, provided the nails are long enough to permit their ends to rest on the ring.—Chas. Black, Hightstown, N. J.



Making Pump Valves Tight

A simple and effective way to tighten permanently the taper-valve holder, or box, in certain types of hand pumps, is found in the use of ordinary rubber cement.

The treatment is simple and requires that the bottom box be removed and the leather covering permitted to dry, after which it is given a coating of rubber cement, which is left to dry for about a half hour. Apply successive coatings until a fairly thick layer of rubber has been applied to the leather covering. This treatment provides a thin rubber gasket that will not only hold the box tightly when replaced, but will prevent water from leaking between it and the pump barrel.—Wm. S. Jacobs, Auburn, N. H.

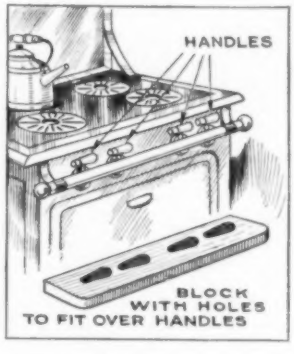
A Sag-Proof Gate Latch

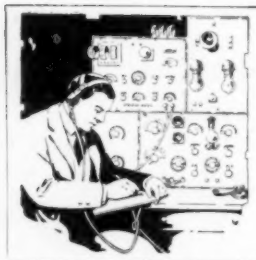
It is difficult to build a gate that will never sag, or that will not expand and contract with changing temperatures, but it is perfectly feasible to fit the gate with a latch that works just as well in spite of the sag, contraction, or expansion.

The gate latch shown in the illustration hooks over a pin, 2½ in. long, placed vertically and held at each end by suitable sheet-metal brackets. The gate may sag, expand, and contract freely; so long as the latch does not move beyond this 2½-in. range, the operation of opening and closing the gate is not interfered with.—Curtis Ralston, Springfield, Ohio.

Lock for the Gas Range

There is always danger of having burners on the gas range turned on by some small child who is not old enough to realize the gravity of the act. To remove temptation from young fingers, a simple lock may be made from a strip of hardwood, a few inches longer than the distance occupied by the set of valve handles. Holes are cut in this wooden strip corresponding to the outline and position of the handles. When the stick is in place, the pipe in front of the handles prevents a child from getting at it easily, even though the habit of tampering with the burners and valves has been learned. The hardwood stick should be thick enough to prevent any of the valves from being turned when it is in place. If the stove has round valve handles, the holes are, of course, shaped accordingly.





A Short-Wave Regenerative Audion Receiver

By F. L. BRITTIN

THE regenerative audion circuit owes its popularity to several causes, chief of which are: low cost, simplicity of operation, and amplification 100 times greater than the ordinary audion capacity. It requires but one audion tube, which serves as both detector and amplifier, receiving damped and undamped waves with equal facility, and a set of this type requires but one high and one low-voltage battery.

Nearly every long-distance receiving record, on 200-meter wave length, by amateur operators in this country, has been made on short-wave regenerative sets. Many have been deterred from the construction of such a set by the seeming difficulty in constructing the variometers, about which, however, there is nothing at all mysterious or complicated. Specially cut wooden blocks are nice and handy but not particularly essential, because cardboard or fiber tubing will answer equally well.

The cabinet, which is best made of birch, can be finished in imitation mahogany. If the wood is carefully sanded and stained, given a coat of varnish, rubbed down with finely powdered pumice and water, and another varnish coat applied which is rubbed down with rotten stone and oil, a cabinet can be produced that is the equal in appearance of the factory-made article. The constructional details for the cabinet are completely illustrated in Fig. 1. A template for the front panel is first laid out on cardboard with the various holes spaced according to the dimensions given. This will save time and prevent errors. Place the template on the panel, and with a sharp instrument, mark off the centers of the holes that must be drilled. The scales for the condensers are laid out and engraved, and the depressions made by the marks filled with jewelers' white to give sharp outlines. The variometer dials are of the type shown. As variometers E and F should rotate 180°, the scales on the dials for these meters should be extended,

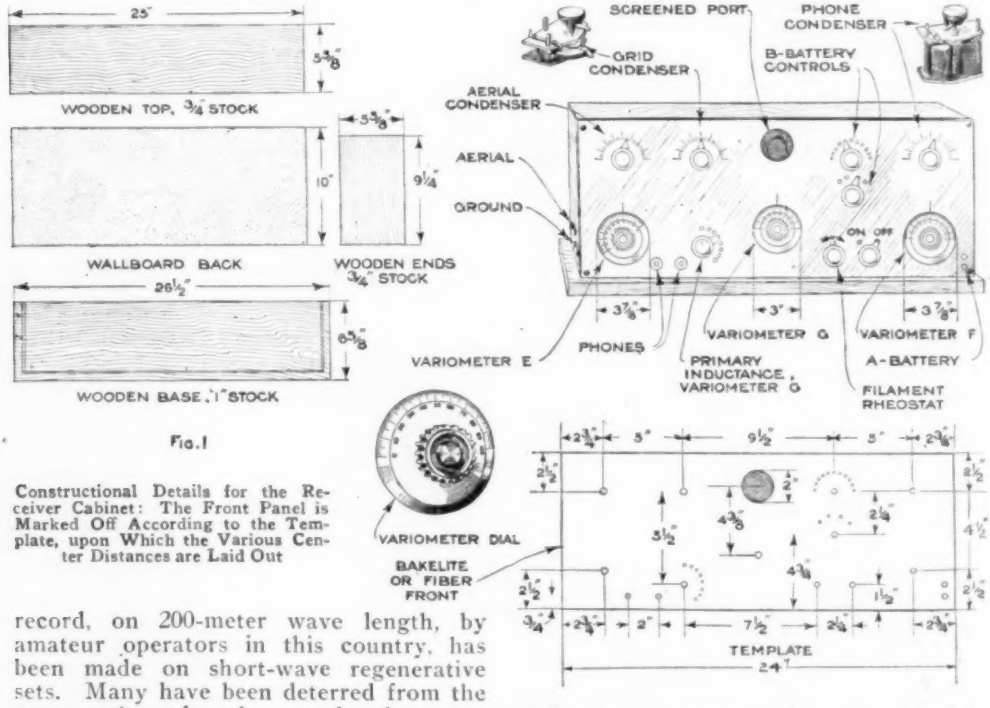


Fig. 1

Constructional Details for the Receiver Cabinet: The Front Panel is Marked Off According to the Template, upon Which the Various Center Distances are Laid Out

as they are divided to only 100° when purchased. The dial for variometer G rotates only 100° and will consequently require no alteration. The grid condenser is of the back-mounted type, has seven plates, and a capacity of .000,1 microfarad; the phone and aerial condensers are of the same type but have 43 plates or more, because the capacity required is .000,1 to .004 microfarad; 43 plates will answer for the aerial circuit, but a larger condenser across the phones may be used if desired, and will give even better results, although a 43-plate condenser will be found sufficient for all practical purposes. The aerial and ground binding posts may be insulated and inserted through the end of the cabinet, or otherwise mounted to conform to individual requirements. The binding posts for the phones are of the two-way type and permit the use of two pairs of phones. The A-battery binding posts are then installed, and the port shown is covered with a piece of cloth or metal gauze, glued to the rear of the panel. This port is provided for the purpose of observing the brilliance of the audion bulb, mounted behind it on a small wood or rubber bracket just above variometer G.

The construction of the several variometers and the method of mounting them, is shown in Fig. 2. The primary of variometer G is wound clockwise on a well-shellacked and dried cardboard tube, with No. 22 single cotton-covered copper magnet wire, and is tapped at every eight turns. A 3/16-in. hole is made through the primary tube to permit insertion of the secondary shaft, as indicated. The primary is mounted on the back of the panel with wooden brackets at top and bottom. The secondary of the variometer G is wound clockwise, on a cardboard tube of the dimensions indicated, also with

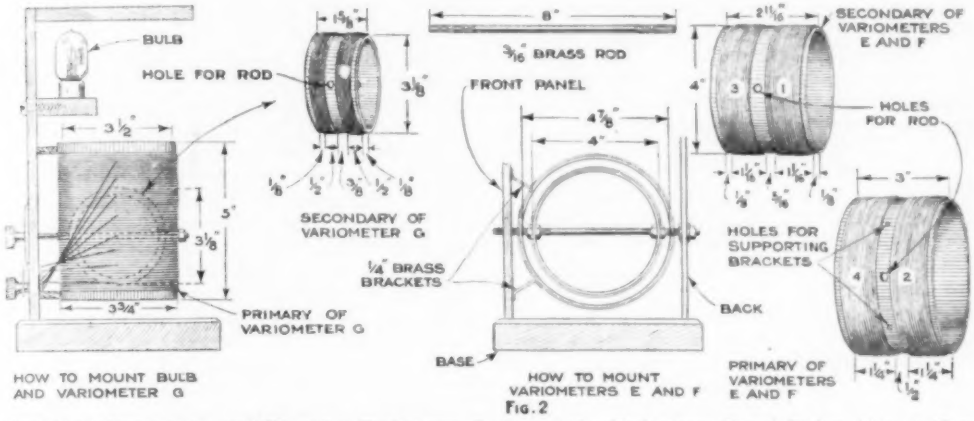


Fig. 2

Method of Constructing and Mounting Variometers G, E, and F: Variometers E and F Are Alike in Construction, but are Wound with Different Quantities and Sizes of Wire. Only the Position of the Coils on the Tubes is Shown, the Method of Winding being Illustrated in the Wiring Diagram Shown Below

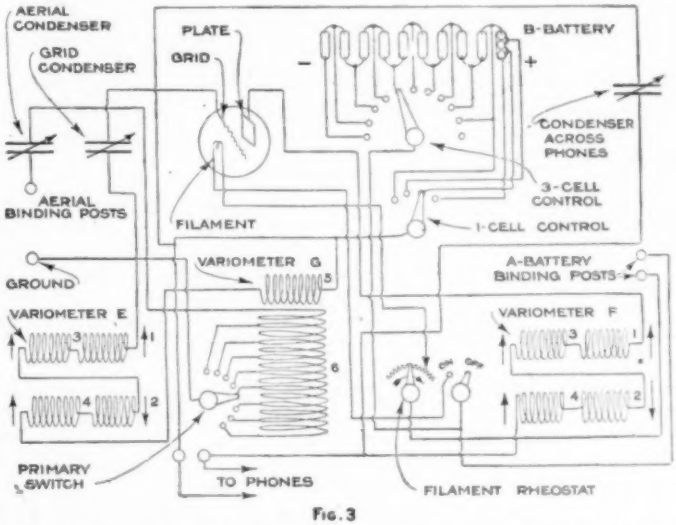


Fig. 3

Wiring Diagram for Regenerative Circuit: The Wiring should be Checked Carefully at Every Stage Before Connections are Made Permanent. Note Connections for One and Three-Cell Controls

No. 22 single cotton-covered wire, wound in two sections of 18 turns each. Variometers E and F are similar in construction; the coils 1, 3, and 4 are wound clockwise and coil 2 anticlockwise, as illustrated in the wiring diagram in Fig. 3. Both variometers E and F are wound in the same manner but with varying amounts of wire. The winding on E requires 33 turns of No. 20 single cotton-covered copper magnet wire for No. 1, 30 turns for No. 2, and 32 turns each for Nos. 3 and 4. The winding for variometer F consists of 25 turns of No. 18 single cotton-covered wire for No. 1, 26 turns for No. 2, 23 turns for No. 3, and 27 turns for No. 4. After the several coils have been wound they should be thoroughly shellacked, to hold the windings in position, and dried until entirely free from moisture. The primaries for the variometers E and F are mounted on the front panel with small brass brackets, suitable provision being made for the suspension of the secondaries on their shafts, to which they are held by small nuts on each side of the tube. The front ends of these secondary rods, or shafts, are screwed into the calibrated dials on the face of the panel and properly adjusted for correct reading. The rods for the variometers E and F are shown extended through the back of the cabinet, but if the primaries are securely mounted, this is hardly necessary.

The primary leads or taps from the variometer G are soldered to their proper contact points, and, following the wiring diagram in Fig. 3, all other connections are made and soldered. The B-batteries are made into two compact banks of five each and securely taped together, one bank being placed at each side of the variometer G.

Finally, trace back the circuit and see that all connections are soldered securely and that the circuit is correct. Screw the V. T. Marconi bulb into the socket placed on the shelf, as indicated in Fig. 2; this special socket can be bought from almost any supply house and is marked "F" for the filament leads, "G" for grid, and "P" for plates. After making these connections the cabinet is ready for use when the wallboard back has been put in place. The A-battery may consist of either five dry cells or, preferably, a six-volt, 40-ampere automobile storage battery.

MATERIAL LIST

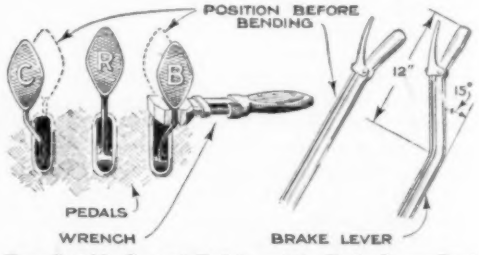
1 piece birch, ¾ by 5⅝ by 25 in., for cabinet top.
1 piece birch, 1 by 6¾ by 26½ in., for base.
2 pieces birch, ¾ by 5⅛ by 9¼ in., for ends.
1 piece wallboard, ⅜ by 10 by 25 in., for back.
1 piece hard rubber, ¼ by 9½ by 24, for panel.
2 variometer dials, complete, 3⅞ in. in diameter.
1 variometer dial, complete, 3 in. in diameter.
2 back-mounted variable condensers, complete, 43 plates each.
1 back-mounted variable condenser, complete, 7 plates.
1 pair double binding posts, for phones.
4 binding posts, for aerial and ground.
5 switch levers, complete, with knobs.
25 contact points.
1 V.T. Marconi bulb and socket.
3 8-in. brass rods, 3/16 in. in diameter, threaded 3 in. at ends.
18 brass nuts to fit threaded rods.
4 brass brackets, to support primary of variometer G.
2 cardboard tubes, ⅛ by 3 by 5⅛ in.
2 cardboard tubes, ⅛ by 2 11/16 by 4 in.
1 cardboard tube, ⅛ by 3¾ by 5 in.
1 cardboard tube, ⅛ by 1⅝ by 3⅛ in.
10 10-cell flashlight batteries, flat type, full test.
¼ lb. No. 22 single cotton-covered wire.
1/16 lb. No. 20 single cotton-covered wire.
1/16 lb. No. 18 single cotton-covered wire.

Bent Auto Pedals a Convenience

The too close placing of the clutch, reverse, and brake pedals of a standard automobile makes it impossible for the driver to place his foot in a convenient position on any of the pedals. By moving the outside pedals farther away from the center, operation is made much easier.

With the floor boards of the car removed, place a heavy monkey wrench about 6 in. below the pedal pad, as the flat part is called, and bend the outer pedals away from the central one about ½ in. Then with one wrench applied under the pedal pad, and another on the bent portion, straighten them as indicated in the drawing.

On the same type of car the brake lever is in an awkward position, as it is beyond



Two Outside Control Pedals and the Brake Lever Bent to Facilitate Operation

normal reach of the operator. Bending this lever further expedites operation.

The lever is bent backward, about 12 in.

from the top, to make an angle of about 15° with the lower part, and the handle section is then bent forward until straight. The small rod that operates the ratchet catch is also bent to conform to the contour of the lever. The parts can be bent cold by using suitable leverage.

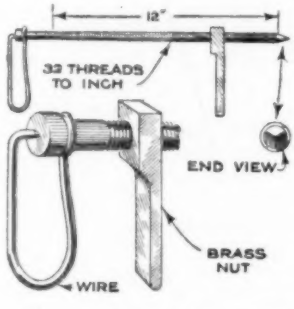
Substitute for Lens Washer

The felt washers used to prevent rattling and movement of the headlight lenses of automobiles, have a very short life, and if a washer is not replaced when worn, dust and dirt sift in and ruin the reflector.

By scraping off the pieces of felt that stick to the edge of the reflector and applying a coat of heavy shellac, one can use a piece of heavy cotton cord about ⅛ in. in diameter, in place of the felt washer. The cord is pressed into the shellac-coated groove all around and is then cut off squarely to make a close joint.

A Simple Speed Indicator

A simple indicator for counting the number of revolutions of a shaft, or other revolving part, can be made from a piece of 3/16-in. round rod. A head is formed on one end and a thread, 12 in. long, 32 threads to the inch, is cut on the rod. A piece of brass is drilled and tapped to form a nut, and a piece of stiff wire bent to form the handle shown.

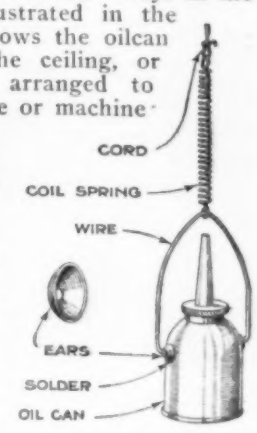


To use this device, the three-faced point is held in the center hole in the end of the shaft, the nut being held at the end of the thread. Timed with a watch, the rod is held against the shaft for 15 seconds, and the distance from the end of the threads to the brass nut is measured with a rule. As an example, if the distance measures 8⅜ in., when the counter is removed from the shaft, the speed is 1,072 revolutions per minute, figured as follows:

There are 32 threads to each inch of bolt and 8⅜ in. were passed by the nut, thus the total revolutions in 15 seconds are $8\frac{3}{8} \times 32 = 268$; and the time being one-fourth minute, the revolutions per minute are 4×268, or 1,072.

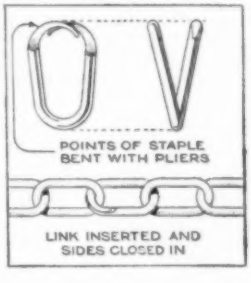
A Swinging Oilcan

A handy method of keeping the shop oilcan where it will not be upset, yet be conveniently accessible and always in the right place, is illustrated in the drawing, which shows the oilcan suspended from the ceiling, or from a bracket, arranged to swing over the vise or machine for which the oilcan is frequently needed. Two ears, of a type found on sirup cans, or similar containers, and easily removed from them, are soldered on opposite sides of the oilcan, just far enough above its center of gravity to cause it to maintain a perpendicular position. A suitable bail, or handle, is provided and the arrangement is suspended at a convenient height above the bench with a spring between the cord and bail so that, while the oilcan is out of the way, it can easily be pulled down to a convenient height for use. The same idea can be applied by having a weight to pull the oilcan up, instead of using the spring.



Repair Links Made from Staples

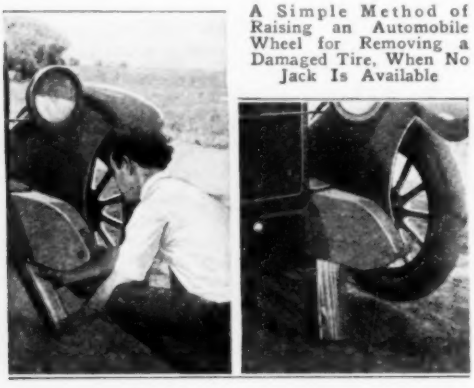
Repair links for chains on which no great strain is to be applied can be easily made from ordinary staples. The ends are bent over toward the center with a pair of pliers, and spread apart to permit insertion into the chain. The repair is completed by flattening the expanded sides together. Such a method can be successfully applied to the repair of tire chains, but care should be used to see that the sharp points of the staples are bent in such a manner that they cannot damage the tire.



¶A worn-out ruling pen can be made into a serviceable scraper for erasing ink from tracings and drawings generally, by breaking off one of the blades and sharpening the remaining point.

An Emergency Auto Jack

A stick of cordwood can be made to serve as an automobile jack when tire

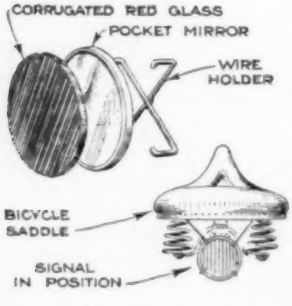


A Simple Method of Raising an Automobile Wheel for Removing a Damaged Tire, When No Jack Is Available

trouble discloses the fact that the useful implement has been left at home. All that is needed is a block of wood, about 2 in. longer than the distance from the underside of the front axle to the ground, with the tire inflated. In use, the block is set against the axle, where the spring is bolted on; this holds the block in place until the weight of the car has been placed upon it. If the car is then driven forward slowly, it is comparatively easy to ascertain just when it is highest from the ground. Then the emergency brake is set, and the damaged tire is clear of the ground.—Dale Van Horn, Lincoln, Nebraska.

Rear Reflector for Bicycles

An economical and practical danger signal for the rear of a bicycle or motorcycle is easily made from a pocket mirror and a piece of transparent ruby glass, cut to the same size as the mirror, to which it is attached with wire clips in the manner shown. Corrugated glass, if obtainable, is to be preferred, although plain ruby glass can be used with satisfactory results. If corrugated glass is used, the ribs or corrugations should be on the outside surface of the glass.



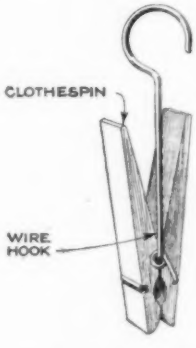
In use, the reflector is suspended from the saddle as shown in the drawing, where its free, swinging motion will catch and reflect the light from the lamps of an automobile or other vehicle approaching from the rear with lamps lighted, warning the driver of the cyclist's presence.

Rawhide for Repairing Snowshoes

Not infrequently a strip of the snowshoe lacing breaks, when the wearer is miles away from home with nothing to make the repair with. Experienced users of snowshoes have found it advisable to carry an extra strip or two of rawhide laced into the snowshoe, for such emergencies.—T. C. Dyer, Collinsville, Conn.

Clothespins to Hold Washcloths

It is a source of constant annoyance in most bathrooms to try to keep the washcloths on the towel racks and holders, as such small cloths simply refuse to "stay put."



The drawing shows how ordinary spring clothespins can be used to hold these small cloths securely in position. A wire hook is fastened to the clothespin by inserting it through the opening at the center. One of these clips is provided for each person, and the cloths can be put in place and removed as easily as from the towel rack. A few clips fashioned in this manner will also prove convenient to the amateur photographer, as they will hold films, when drying, quite as well as the purchased articles.—Ruth Darling Shultis, Lansing, Mich.

Lubricating Leaf Springs

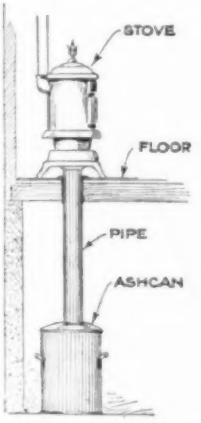
When the automobile springs become dry and begin to squeak, few people bother to separate the leaves and force lubricant between them, but many do attempt to squirt oil along the edges of the leaves in the hope that it will work in and stop the noise.

Ordinary machine oil is too thick for this purpose, but if cylinder oil is diluted with one-half or two-thirds of its volume of gasoline, much better results will be obtained. The gasoline makes the oil thin enough to seep in between the leaves,

and in addition, helps to cut through the old oil, grease, and dirt that is so often caked on the outside of the spring. The lubricating qualities of this diluted oil are not so great as of the straight oil, but wherever the gasoline mixture penetrates some of the oil will go, and for this use a little oil is better than none at all. Where means of forcing the leaves apart are available, this should be done, and the leaves lubricated with a good graphite grease. It is occasionally a troublesome job thoroughly to lubricate the springs, but it is one that repays the effort.—G. W. Greene, Madison, Wis.

Chute for Dumping Ashes from Stove Directly into Basement Can

The drawing shows how the ashpan of a heating stove may be altered so that it is no longer necessary to carry the ashes through the room when emptying them. A hole large enough for a 6-in. stovepipe is cut in the center of the ashpan and stove bottom, and a slightly larger hole in the floor immediately underneath; the latter hole is fitted with a flue ring, to guard against danger of fire. A section of 6-in. pipe is fastened to the ashpan and brazed, if possible, so that there is no danger of ashes escaping around the pipe; for additional safety, a ring of stove cement should be placed around the hole in the bottom, between the bottom and the ashpan, and should completely seal all apertures. Sections of pipe, passing through the floor, lead to a covered ashcan in the basement, where the ashes may be allowed to collect as they are shaken from the stove.—H. F. Grinstead, Columbia, Mo.



Making Modeling Clay

Modeling clay is made by kneading dry clay with glycerin instead of water. Work thoroughly with the hands. Work in process, or finished, must be moistened every day or two and kept covered, to prevent evaporation, which would leave the clay hard and difficult to work.

Smoking One's Own Pork

Even if one does not raise his own pork, he can cure it to his own taste

An Improvised Smokehouse for the Curing of Pork can be Built and Operated at Practically No Expense. Hickory Wood or Corncobs are Used for Producing the Smoke

and satisfaction, all that is required being a small container. A dry-goods box, or even a barrel, answers the purpose.

As shown, the container, or smoking chamber, is elevated above the surface of the ground, and the fire, which furnishes the smoke, is built in a tin pail a little to one side. A stovepipe carries the smoke from the pail to the smoking box, where the meat absorbs the characteristic flavor. A piece of scrap tin is used to cover the pail, and either corncobs or hardwood is used for fuel. Hickory is especially desirable, if obtainable, but corncobs will produce excellently flavored meat. Beech, and woods that contain resin, should not be used for smoking meat, as they will impart a bitter taste to the product.—John Y. Beaty, Chicago, Ill.

Phonograph as a Banding Wheel

One of the most difficult pieces of work the decorator of pottery or china has to do is to make a continuous band of color around an article so that it will not deviate from the horizontal but will meet perfectly at the ends. The drawing shows how a phonograph can be used as a banding wheel. The brush is held firmly at the proper height and brought in contact with the work as the latter rotates.

An Inexpensive Collection Box

A collection box for the purpose of receiving contributions for charitable or civic purposes, one that is inexpensive and that may be locked to protect it from petty thieves, is shown in the illustration.

The coin receptacles are milk bottles, placed on either side of the square upright, and supported by stout brackets. A movable crosspiece, with slits cut in it for the insertion of the coins, rests upon the top of each bottle and is locked in position by a small padlock. Both brackets and crosspiece are counterbored, about ½ in. deep, to receive the bottom and top of the bottles, so that when the crosspiece is locked the bottles cannot be removed from the stand.

"Baby-Proofing" the Door

The amount of watching and anxiety spent by mothers of small children to prevent them from getting their fingers caught between the hinge side of the door and the jamb can be almost wholly eliminated by a simple remedy.

A strip of carpet, leather, or similar material, is tacked to the edge of the door and frame; this does not interfere with opening or closing the door, but it does prevent little fingers from being caught and pinched, if nothing worse, by the closing door.—Charles Homewood, Ontario, Calif.

Using the Crank to Back the Car

Upon returning from a motor trip, I ran out of gasoline just as I had driven up to the garage. As it was late at night, it was impossible to obtain an additional fuel supply at the time, and so I attempted to push the car up the inclined approach to the garage. Failing in this, as the car was too heavy, the gears were thrown into low speed and the starting crank turned, whereupon the car was cranked into the garage with comparative ease. The same idea worked equally well in backing the car by throwing in the reverse gear.—L. F. Bockstanz, Ludington, Michigan.

Open-Flame Gas Burners Wasteful

The open-flame gas burner with the large tip, generally known as the "jumbo," is thought by many to give more light without using more gas. This is certainly not the case, for such an open-flame burner, although it will burn six times as much gas as certain types of mantle burners, gives no more illumination. Moreover, like all open-flame burners, it is dangerous unless it is provided with a protective cage.

Swing Ropes from Inner Tubes

Many inner tubes are discarded while they still retain their "life" and elasticity, on account of having been run flat and rendered useless for their original purpose. A motorist having several such tubes put them to good use in the construction of a swing "jumper" for the small children of his neighborhood.

Two tubes were used for each swing; each tube was cut into three longitudinal strips, which were then braided, or plaited, to make a three-ply rubber band. The seat of a discarded nursery chair was suspended from these bands, the result being a jumper swing that provided endless entertainment for the youngsters.—G. E. Hendrickson, Argyle, Wis.

Stripping Film from Old Negatives

A quick method of removing the gelatin film from old glass photographic negatives is somewhat different from the usual way of soaking and scraping. By this method it is only necessary to immerse the negative in water for a few seconds, or just long enough to wet the film slightly; the superfluous water is removed with blotting

paper or a piece of cotton, then, with the balls of the thumbs, as shown in the photograph, the film is rolled off the plate.—T. K. Flanagan, Jersey City, N. J.

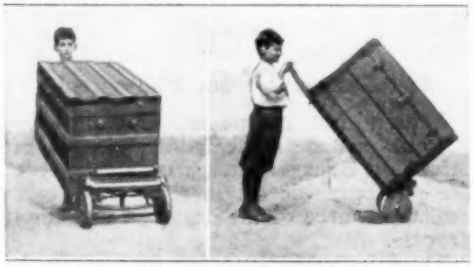
Multiple Connections for Electric Utensils

With electric toasters, percolators, grills, and other utensils coming more and more into general use, a whole meal can be prepared at the table with electricity. Each utensil comes equipped with a 4 or 5-ft. cord, and when two or more such devices are used at the same time the table becomes a tangle of electric wires. It is also very inconvenient to use a two or three-way socket and screw in the separate plugs and remove them before and after each meal.

By taking a narrow strip of hardwood and using it as a base for a suitable number of porcelain receptacles connected to the source of current, most of the wires can be dispensed with and the plugs inserted very conveniently. Sides are built around the base, high enough to conceal the inclosed receptacles. A cover, having holes large enough to permit the insertion of the plugs is also provided, and the whole finished as desired. The single connecting cord is brought through a hole at one end. The plugs of the utensil cords should then be removed and the wires shortened to a convenient length.—Chas. L. Kribs, Dallas, Tex.

Lawn Mower Used as Baggage Truck

The lawn mower has other uses besides smoothing off the lawn, for, as shown in the photographs, it can be used for the convenient transportation of trunks and similar bulky packages.

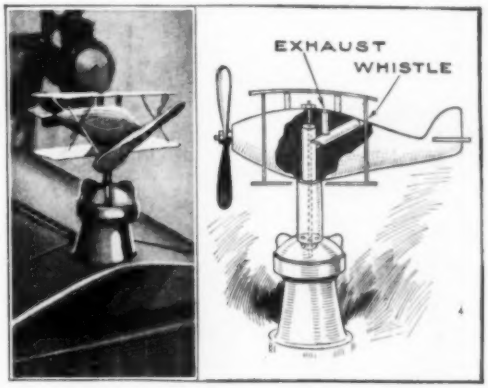


When the Mower is Reversed the Blades do Not Revolve as the Load is Pushed Forward

The mower is reversed, and the load is put in position so that it does not bear against the wheels, but is supported by the wooden roller. The mower may then be pushed or drawn as easily as a truck.

Whistle Warns of Overheating

The miniature aeroplane shown in the illustration is something a little more



An Automobile-Radiator Ornament, in the Form of an Airplane, Has a Whistle Concealed in the Wooden Fuselage, Which Warns the Driver When His Engine is Overheating

than a mere radiator ornament, because, concealed in the solid wooden fuselage, or body, there is a whistle that warns the driver that his engine is overheating.

The body of the airplane is carved from a solid block, and to it the tin wings and wire struts are fastened. A ⅜-in. hole is drilled through the center of the radiator cap for the long bolt that holds the plane in position. Around this hole three or four smaller holes are drilled, to permit the steam to pass up through the piece of tubing that supports the plane. A ½-in. hole is bored from the bottom of the plane, but not entirely through the body; this hole is directly over the upper end of the tubing and carries the steam to a small whistle fitted into a hole cut at an angle to the ½-in. hole, as indicated. Another hole in the body is provided for the escape of the steam into the atmosphere.—Hallie H. Holt, Enid, Okla.

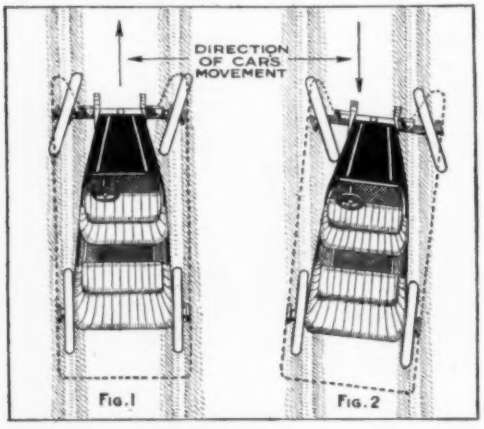
Removing a Cork from a Bottle

It is a common experience, and an annoying one, to have a stubborn cork forced right through the neck of a bottle.

Procure a piece of strong twine, about 1 ft. long, and tie a large knot in one end of it. Drop this knotted end down into the bottle; invert the bottle so that the cork will fall to the mouth below the knot in the end of the twine, then give the twine a sudden jerk. This will usually be sufficient to pull the cork through the neck and entirely out of the bottle.—Robert Lee Bird, Roanoke, Va.

How to Get Out of the Ruts

When driving an automobile in a rut, the average driver is at a loss, when

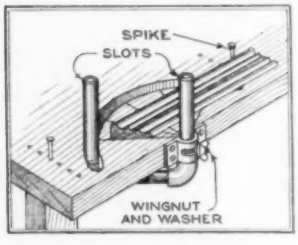


Climbing Out of a Rut When Moving Forward, as in Fig. 1, Is Difficult, but by Turning the Wheels, as in Fig. 2, the Car can Easily be Backed Out

meeting another car, as to the proper thing to do to get out of the way. Cramping the steering wheel over, as in Fig. 1, will not cause the car to climb out of the rut when driven forward. However, by turning the steering wheel in the opposite direction, as in Fig. 2, and placing the gears in reverse, the front wheels will immediately climb out.

A Miter Box for the Workbench

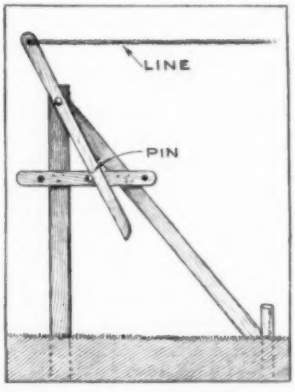
A permanent miter box on the carpenter's or cabinetmaker's workbench is almost as essential as a vise, and one built along the lines shown in the drawing can be detached easily when its presence is undesirable.



A U-shaped saw guide is made from three pieces of pipe and a pair of elbows, and slots are cut in the perpendicular lengths of pipe for guiding the saw, the slot nearest the worker being enlarged to accommodate a bolt, with a wingnut and washer, as illustrated. A 180° arc is laid out on the bench, and a slot cut through the top of the bench, through which one of the pipe arms is inserted. The device is attached to the edge of the workbench by means of a clamp. The center of the clamp is slotted to fit the bolt used for tightening the guide. The work is held to the angle of the cut to be made, by means of spikes inserted into a series of holes drilled in the top of the bench. When it is desired to remove the mitering arrangement, it is only necessary to loosen the wingnut and pull the saw guide down, so that the tops of the guides are just flush with, or a little below, the surface of the bench, leaving the device available for instant use.—Truman R. Hart, Ashtabula, Ohio.

A Clothesline Tightener

A clothesline, high enough to swing the clothes free from the ground, must usually be lowered so that it can be reached to hang the clothes on it. The arrangement shown in the drawing permits the line to be lowered to an accessible position and makes use of the customary props unnecessary.



A lever is bolted to one of the posts, the clothesline being tied to the end of the former, as illustrated. When the line has been drawn up as taut as possible by means of the lever, it is held in position by inserting a pin into a stout bar that is nailed to the post and drilled to receive the pin.

Pen Drawings from Photographs

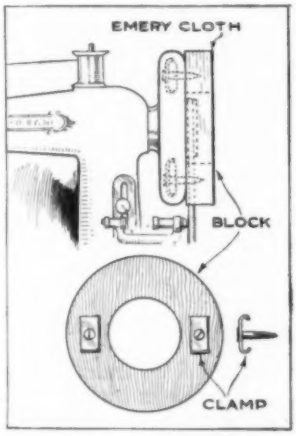
Pen-and-ink or pencil drawings and sketches can be made from photographic prints or enlargements, with no trace of the photographic origin remaining to reveal the source of the design, by a simple process.

The print or enlargement is made in the usual manner, and dried, after which the outline and detail is worked in with waterproof India ink or pencil; this leaves the print ready to be bleached. A bleaching solution is made by dissolving 60 gr. of potassium iodide and 6 gr. of iodine in a pint of water. Placed in this solution, the

photographic image takes on a dark blue color. After removal from the bath, the print is washed and introduced into a plain hypo solution, where the image disappears entirely, while leaving the inked outline and detail still plainly visible. After the print has been washed and dried, any additional detail can be added.

A Hair-Clipper Sharpener

A pair of hair clippers are of little use when they once become dull, and means for sharpening them are not usually as conveniently at hand as are those for sharpening other tools. Clippers must be sharpened on a flat surface and cannot be sharpened on the periphery of a grindstone or emery wheel, as a pair of shears or a knife. To construct the grinder illustrated, a disk is cut from a 1-in. board, a little larger than the handwheel of the home sewing machine, and a hole is cut through the center to clear the clutch of the machine, allowing plenty of room to prevent it from binding. Two metal clamps, long enough to reach over two spokes of the wheel, are made; these are used to clamp the wooden wheel to the handwheel of the machine, ordinary wood screws being used for the purpose. The wooden wheel is faced on its exposed side with a piece of the finest emery cloth obtainable. The emery cloth is cut to size and attached smoothly to the wooden surface with ordinary liquid glue.

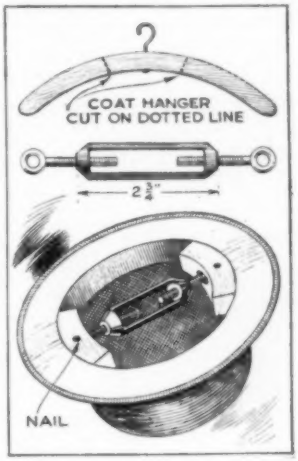


In use, the clutch of the sewing machine is released, and each of the two cutting parts of the clippers is held flat against the emery cloth as the wheel revolves. A newspaper may be fitted around the head of the machine to prevent particles of the abrasive from entering the operating parts.

¶Wire wastebaskets fastened over the electric lights of a playground or gymnasium will effectively prevent breakage of the globes.

Making a Hat Stretcher

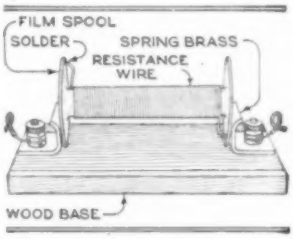
While the individual demand for hat stretchers is not large, there are times when such a device can be advantageously used, and the illustration shows how such a stretcher can be made from a small turnbuckle, such as can be bought for a few cents, and an ordinary coat hanger.



The coat hanger is cut as shown, and the curved ends are attached to the turnbuckle. A hole is drilled through the centers of the curved wooden sections, and the ends of the turnbuckle attached to them with nails. In use, the stretcher is inserted inside the hat and the turnbuckle turned, stretching the hat as desired.—Harry Stark, Brooklyn, N. Y.

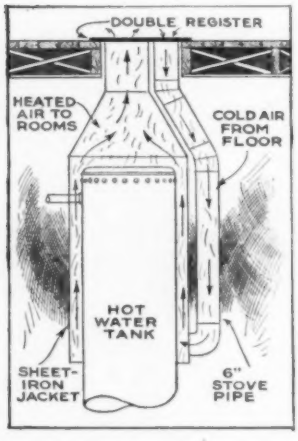
Resistance Units from Film Spools

Fine resistance units for the use of electrical experimenters can be made from old film spools. The spools can be had from any photographer for the asking, and it is on these that the resistance wire is wound, the ends being soldered to the metal flanges of the spool. A holder, such as the one shown in the drawing, is used, and consequently all the resistance spools must be the same length. By winding a number of spools with a varying number of turns of resistance wire, and marking the known resistance on them, it is a very simple matter to substitute one spool for another by inserting it between the clips, in the same manner as a cartridge fuse. The ends of the spools bearing against the clips are polished bright, to provide a good contact, and the clips should press tightly against them.



An Auxiliary Heating System

The particular installation described in this article is typical of many others in which water is heated by a coil inside the furnace firepot, an arrangement providing plenty of hot water even in the mildest weather. In cold weather, when the furnace was heavily fired, the water would get very hot; this caused a real loss of fuel which should have been used for heating the upper part of the house, and also kept the temperature of the basement higher than desirable for the storage of fruit and vegetables. An effort to jacket the tank with asbestos paper was made, but this resulted in the water boiling before the house was warm enough to permit shutting the furnace off. To overcome the difficulty, the tank was jacketed as shown in the drawing, and the heat conducted to the room above through a double floor register, the cold-air pipe being put in to create a better circulation of heat and to avoid the necessity of closing the register when shoveling coal or ashes below. The jacket was made in halves and fastened together around the boiler with tin straps. The housing, or jacket, covers only about three-fourths of the heater, as the hottest water is, of course, always at the top of the tank.



The advantage of such an auxiliary heater is that the colder the weather, the more efficient it becomes, while in mild weather the register can be closed and the jacket provides an effective insulation for the tank and prevents, in large part, the radiation of heat within the basement. —W. S. Robinson, Minneapolis, Minn.

An Odd Goldfish Bowl

An electrician has discovered that a burned-out 1,000-watt electric bulb can be used as an aquarium. The only alteration made in the bulb is a handhole in the large end. This hole is formed by heating the area with the flame from a blowtorch until the glass is plastic, when the vacuum inside the bulb will suck in the softened glass. While still soft, the unnecessary glass is broken off, and the edge of the hole finished smooth with a heated iron rod. After the glass has been allowed to cool gradually, the bowl is ready. It is kept in a vertical position by screwing it into a socket mounted on a wooden base, the socket being concealed underneath a suitable canopy.—George F. Paul, Chicago, Ill.

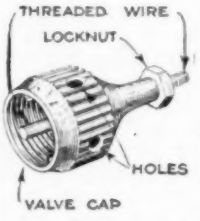
Bathing Cage Birds

Young canaries and other cage birds often refuse to take their baths, a lack of which is usually fatal to both the plumage and song. I had a canary that refused to have anything to do with the bath dish and I finally hit upon the idea of using an atomizer, such as used for spraying the throat.

The atomizer was filled with water and the bird sprayed, to its apparent great enjoyment.—Jack L. Dickler, New York, New York.

Deflating Inner Tubes

Everyone who has repaired inner tubes has experienced the trouble incident to deflating a tube so that it contains no air. If the tube is to be repaired or put away for future use, it is necessary to roll it up in order to expel all the air. Rolling the tube requires the use of both hands, and the difficulty of holding the tire valve open while the air escapes is apparent; the usual method is to resort to a match, nail, or similar article. A better way is to use a simple device made from an old valve cap.



A hole is drilled through the cap lengthwise, and, if possible, threaded to take a short length of stiff wire or rod that is similarly threaded and provided with a nut for locking it in place. If it cannot be threaded, the rod may be soldered in place. Several holes are drilled through the walls of the cap. When this cap is screwed onto the valve the projecting wire in the center will press down the valve and hold it open so that, as the tube is rolled up, the air will escape through the holes in the side of the cap.—John A. Ford, Los Angeles, Calif.

PRIZE OFFERS

CONTEST FOR BEST STORY OR SCENARIO OFFERS PRIZES OF EXCEPTIONAL VALUE

Much interest has been aroused, particularly among "movie fans," by a series of prizes offered by the Chicago Daily News for the best story that can be converted into a moving-picture scenario. The contest is distinguished by its comprehensiveness, and by the unusual value of the prizes offered.

Everyone is eligible except employes of the Daily News and the Goldwyn Pictures Corporation, and 31 prizes, aggregating $30,000, will be awarded as follows: first prize, $10,000; then 10 of $1,000 each, and 20 of $500 each.

The rules of the contest are: Every contestant must register with the Scenario Contest Editor of the Chicago Daily News, before sending in a scenario, and subsequently all manuscripts must be sent to the same address. Legal assignment to the Chicago Daily News Co. of all copyrights of the scenario submitted must accompany the manuscript, it being understood that this assignment will be waived on all scenarios that do not win prizes. Manuscripts must be of not more than 5,000 words, typewritten, or in legible handwriting, on one side of the paper only, and may be in either scenario or short-story form. All manuscripts must be in the hands of the Chicago Daily News Co. by midnight, Nov. 1, 1921.

Contestants may send in as many stories as they like, but no two prizes will be awarded to the same person. The Chicago Daily News carries daily, in forms convenient for clipping, the registration blank and the form of assignment.

In connection with this contest it is pointed out that it is not necessary to be an expert writer, as the prizes will be awarded with regard exclusively to the interest of the story itself, quite apart from any literary merit.

The judges' committee is composed of nine of the most prominent writers, critics, and motion-picture authorities in the country.

NEW YORK WORD-BUILDING CONTESTANTS MONOPOLIZE LIBRARY DICTIONARIES

In a recent issue of this magazine announcement was made of a contest that involved word building. In any such contest it is, of course, conceivable that if anyone had the time and the patience to go through the dictionary from A to Z, it would be easy to make the highest possible score. Many persons in New York City appear to have both the patience and the time, as well as the ambition, to make this perfect score, for at the public library these word-building contestants have monopolized every dictionary for such long periods that the authorities have had to tie these books to desks, over each of which is placed the following notice:

"Not to be removed. This dictionary is for reference use only. In fairness to others you are asked to limit your use of it to the shortest time possible. This copy may not be used for reading, or continuous study."

PRIZE FOR HELICOPTER DEMONSTRATION WHICH MUST BE MADE IN FRANCE

A prize of 25,000 francs (normally $5,000) is offered by the Aero Club of France for the first helicopter that demonstrates its ability to rise vertically to a height of 25 meters (about 80 ft.), and to return to the earth safely. The conditions are: The test must be made in France; the contestant must be the constructor of the machine; the offer is international, but the competitor as well as the pilot taking part in the demonstration must be citizens of a country that belongs to the International Aeronautical Federation, or, if not, of a country belonging to the League of Nations. The test will be made by attaching to the helicopter a cord 25 meters long with a weight of 10 kilograms (22 lb.) at the end of it resting on the ground before making the ascension. From this point a circle, with a radius of 25 meters, is to be drawn on the ground, and when the helicopter has been raised by its own propelling means alone, high enough to lift the weight from the ground, it must hang within this circle. After that the helicopter must land without suffering any serious damage. Any offer to compete must reach the aviation commission of the Aero Club of France at least 15 days, and at most 20 days, before the day that the competitor wishes to make the demonstration. This offer must be accompanied by the sum of 1,000 francs (normally $200), which will be returned if the helicopter leaves the ground.

PRIZES OFFERED TO TEACHERS WHO HELP CHILDREN WRITE SAFETY-FIRST ESSAYS

In the September issue of this magazine announcement was made of the offer by the National Automobile Chamber of Commerce of 500 prizes for the best essays on safety written by grammar-school children. This offer has brought so many inquiries for material for safety education that the automobile industry has decided to offer $1,000 in cash prizes for the best lessons in safety education submitted by grammar-school teachers. Each contestant is to submit an outline of a plan for a classroom lesson for children, instructing them how to avoid accidents when on the streets. There will be three prizes of $500, $300, and $200, respectively, the first prize including, besides the cash, a trip to Washington. The contest will take place during the fall. The exact date, and all other conditions, will be sent to all of the schools of the country.

SERVICE BUREAU ESTABLISHED TO GIVE INFORMATION ON WOOD PRESERVATION

With objects which, epitomized, mean making one stick of timber do the work of several, the service bureau of the American Wood Preservers' Association has been established, with headquarters at the Otis Building, Chicago. It is the aim of the bureau to promote the use of wood properly treated to resist decay, marine borers, and insect attack, thereby aiding in the conservation of the forest resources of the nation. The headquarters will be the repository for reliable information on the practice of, and the results obtained from, the art of wood preservation. Advice will be furnished regarding the treatment of timber according to the standards of the association, and also on the use of treated wood. This service will be rendered by means of answers to any inquiries sent to the bureau, and by arranging for attendance and addresses at universities and meetings of organizations interested in the use of lumber. The motto of the bureau is: "Wood is good but—treated wood is better."

EXAMINATIONS FOR SURVEY COMPUTERS BY U. S. CIVIL SERVICE COMMISSION

Civil Service examinations will be held Nov. 2-3, 1921, for computers to fill vacancies in the Coast and Geodetic Survey, for duty in Washington, D. C., at $1,400 a year, and for duty at Manila, P. I., at $2,000 a year. The increase of $20 a month granted by congress will be allowed to those whose services are found to be satisfactory at the end of the first month. All male citizens, who have not reached their 70th birthday on the day of the examination, are eligible. The subjects of examination will be mathematics, astronomy, physics, surveying, practical computations, and one foreign language.

Applicants may be examined at any place at which this examination is held, regardless of their place of residence; but only those who have been domiciled in the state in which they reside for at least one year previous to the examination, and who have the county officer's certificate in the application form executed may become eligible for permanent appointment to service in Washington.

All desirous of competing should at once apply for form 1312, stating title of the examination, to the Civil Service Commission, Washington, D. C., or to the Secretary of the U. S. Civil Service Board in the applicant's locality.

CONTEST OPEN TO STUDENTS OF CHICAGO ART INSTITUTE FOR MODEL IN CLAY

A contest, open to all students or alumni of the Art Institute of Chicago for a model in clay of a fountain, is announced by the Chicago Daily News. The winning model will be executed in bronze, and will be placed before the Daily News Fresh-Air Fund Sanitarium on Simmons Island, off Lincoln Park. A capital prize of $1,000 is to be given to the student who, in the opinion of the judges, designs the best fountain emblematical of the purposes of the sanitarium. Other cash prizes of $100 and $50 will be given as second and third prizes.

The contest opens with the beginning of the fall term at the Art Institute, and will close April 15, 1922. A set of rules in printed form governing the contest can be obtained from the Daily News office, 15 N. Wells Street, Chicago, Ill.

PRIZES FOR BEST STORIES CONCERNING INFANTRY PLATOONS IN LATE WAR

One of the results of the experiences of the World War was the enormously enhanced value of the infantry unit known as the platoon. The manner of handling this unit, in both attack and defense, is now of the utmost importance, and for this reason the Army and Navy Journal offers prizes for the best stories of accounts of the handling of infantry platoons in action during the late war. The only condition is that the story must be written by some one who was an actual member of the platoon, or a near-enough eye witness to insure the accuracy of the description. Each story should be accompanied by a sketch map illustrating it. The prizes offered are: first, $100; second, $50; third, $25, and fourth, $15. The story must reach the journal by December 31, this year.

PRIZES FOR AMERICAN-HISTORY ESSAYS OFFERED BY KNIGHTS OF COLUMBUS

A movement which will result in a comprehensive series of pamphlets on American history, and which, it is estimated, will ultimately cost $1,000,000, has been inaugurated by the Knights of Columbus. As a first step in this connection, they offer $7,500 in cash prizes for essays on historical subjects. The first prize of $2,500 is open to professors of American history in colleges in the United States. Five other prizes of $1,000 each are offered to school officials, and to students who have access to material in the universities and libraries of Canada, Mexico, and Central and South America, as well as to similar institutions in the United States. Manuscripts are not to exceed 4,000 words, and are to be sent to Wm. J. McGinley, at Knights of Columbus headquarters, New Haven, Conn., where full information regarding subjects, and other particulars, may be obtained. The final awards will be made at the 1922 meeting of the supreme assembly.

CANADIAN INSTITUTE OF CHEMISTRY ANNOUNCES ITS OBJECTS

Letters patents have been granted to the Canadian Institute of Chemistry, an association, without share capital, of chemists and professors throughout Canada. The association's objects are: to maintain a high standard in the profession; to form an organization available for consultation by the government; to encourage original research; to establish scholarships; to hold public lectures and examinations, and to promote the well-being of chemists.

CONTEST OPEN TO ALL SALESMEN FOR CLEVEREST SALE STORY

Most salesmen are proud of telling how they made some particularly artful sale, or staggeringly large one, and now they will have a chance of doing it in writing, and getting paid for it at that. The Indianapolis Star offers $500 in prizes for the cleverest sale story. There will be six prizes, respectively as follows: $200, $100, $50, $25, $15, and $10, with 10 additional prizes of $5 each, and 25 of $2 each. The conditions are: Contest begins Sept. 15, 1921, and closes November 15. The story must not be longer than 300 words. It must be a true experience. Stories must be written and signed by salesmen who sell goods in Indiana, and on the stationery of the firms they represent. Literary merit counts only 10 per cent, the other 90 per cent is for the intrinsic value of the story. Stories should be addressed: Editor, "My Cleverest Sale Story Contest," Indianapolis Star.

NORTHWEST FRUIT EXPOSITION OFFERS PREMIUMS AND PRIZES FOR EXHIBITS

The first annual Pacific Northwest Fruit Exposition is to be held in Seattle, Wash., November 21-26. It will be the largest exposition of its kind that has ever been held in this country. It will include exhibits of all kinds of fruits, large and small, produced in the states of Washington, Idaho, and Oregon, and is to have an educational feature consisting of daily lectures on all topics of interest to fruit growers. A cash prize of $1,000 is offered for the best community exhibit. Prizes in merchandise to the value of over $5,000 will also be offered. Entries for the community-exhibit prize, for which 200 sq. ft. of space is offered each exhibitor, must be in by November 1. The exposition is under the management of a board of 26 trustees, with an executive manager.

TEN PRIZES FOR SHORT STORIES

Ten prizes of $100 each for the best short stories, of 3,000 to 10,000 words, are offered by True Stories Magazine, 119 W. 40th Street, New York City. Stories must be received before Dec. 31, 1921. Winning stories will be published in the magazine.

CONTESTS PREVIOUSLY ANNOUNCED

Students of Railroad Engineering: Scholarships; announced March issue, 1920; closes Dec. 31; offered by the Southern Pacific.

Essays on the Life of Roosevelt: Scholarship prizes valued at $1,000, $750, and $500; announced August issue, 1920; closes Dec. 31; address, Woman's Roosevelt Memorial Association.

New Methods of Testing Hardness of Metals: Prize $1,000; announced October issue, 1920; closes Jan. 1, 1922; address, Institution of Mechanical Engineers, London, England.

Piano and Strings Quintet by an American Composer: Prize $500; announced July issue, 1921; closes Nov. 1; address, M. Gobert, 4 W. 130th St., New York City.

Essays on Economics: Prizes, $1,000 and $500; announced June issue, 1921; closes Dec. 31; address, Dr. Wm. T. Foster, Newton 58, Mass.

Medals, Diplomas, and Money Awards: Announced August issue, 1921; awards offered by the Franklin Institute.

Essays on Contributions of Jews to Hygiene: Prize $1,000; announced August issue, 1921; closes Nov. 1, 1922; address Jewish Publication Society of America, 1201 North Broad St., Philadelphia, Pa.

For Service to the City of Philadelphia: Prize $10,000; announced September issue, 1921; awarded in spring or summer of 1922 by Edward Bok, former editor of The Ladies Home Journal.

Orchestral-Composition Contest: Prize $1,000; announced September issue, 1921; closes, Jan. 1, 1922; address, Carl D. Kinsey, 624 S. Michigan Ave., Chicago, Ill.

Safety-First Essays: Prizes, a trip to Washington and gold watch, a gold loving cup, a silver loving cup, and other state prizes; announced September issue, 1921; closes late in the fall; address any public-school teacher.

Essays on Cruelty of Trapping: Prizes, $100, $75, $50, and 2 special prizes, $50 and $25; announced Oct., 1921; closes Dec. 31, 1921; address, American Humane Association, Albany, N. Y.

Research Thesis by a Woman: Prize $1,000; announced October issue, 1921; closes Feb. 25, 1922; address, Dr. Lilian Welsh, Goucher College, Baltimore, Md.

Photos and Plans of All-Shingled Houses: 12 prizes graduated from $250 for 1st to $25 for 12th; announced, October issue, 1921; address, Shingle Branch, West Coast Lumbermen's Association, Henry Building, Seattle, Wash.